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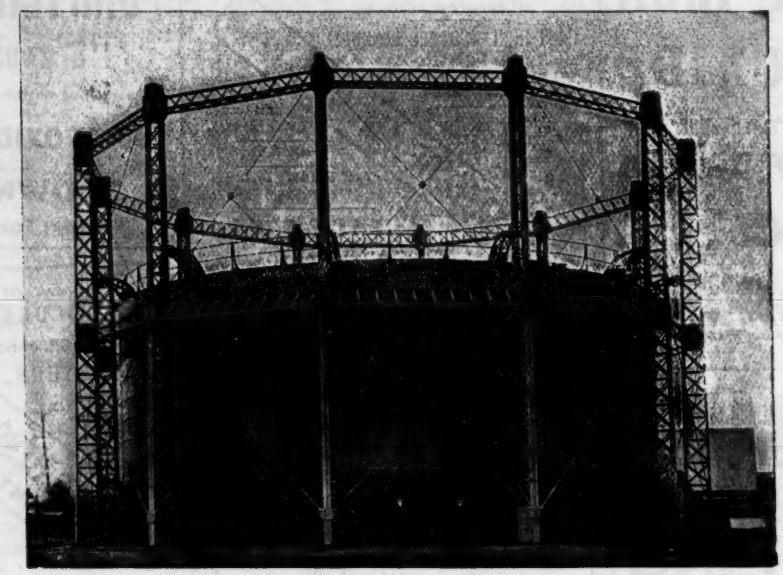

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VOL. CLI., No. 2989.] WEDNESDAY, AUGUST 25, 1920. [72ND YEAR.

EDITORIAL NOTES.

Gas Workers' Wages—An Easier Situation.

THERE would not have been a shred of justification for the leaders of the Unions composing the National Federation of General Workers pressing to the brink of a contest (and perhaps right into one) their new claim for an additional 1s. a day or shift for all workers. Nobody wants a strike in the gas industry; and if a majority of the workers voted for one, it would be more out of loyalty to the Union leaders—excepting, of course, the extreme elements who are always more or less in pugnacious mood—than to any personal earnest desire to descend even temporarily from current wages to trade union strike pay, or because there is any universal belief among the employees that, for the hours they are now working and the nature of the work upon which they are engaged, they are honestly entitled to more pay. As a result of the conference at Oxford last Wednesday, the position became easier. The policy of holding a pistol at the head of the industry was dropped for the time being; and the conference took the sensible course of returning to those constitutional methods which should prevail in these matters between all sane men. To tell the truth, we were beginning to get vastly disappointed with certain of the leaders whom we have held in respect, and of whom we believed that they were animated by what they truly considered fair-dealing. There was, however, something very irrational about the last claim made (coming immediately on top of the recent settlement) in time and amount; also in the manner in which it was being pressed; as well as in respect of the arbitrary hints that were made in the newspapers that the new claim would have to be settled before a system of zoning and grading was completed and agreed upon, despite pre-arrangement. We have a preference for statesmanlike and not despotic action.

Of course, we do not know what was said behind the closed doors at Oxford; but there was a decided difference in the tone of the announcement that was subsequently made to the Press from the recent statements which were accompanied by flourishes that were intended to convey the impression that something very serious indeed was going to happen if the employers of the gas industry did not promptly toe the line. The resolution passed at Oxford was inspired not by the University atmosphere, but by the blending of the commonsense of those who took part in the Union conference. It instructed the Negotiating Committee—having regard to the fact that zoning and grading are to be used to meet the claims for further increases in the wages of those employed in the industry—to meet the employers on this issue, on the understanding that agreement in connection with zoning and grading should be completed at the earliest possible date. There is not a word in the published resolution about the 1s. per day or shift increase. According to the report, a great deal of progress has already been made in the formation of zones in various parts of the country for the fixing of wages. For instance, in Lancashire and Cheshire agreement has been reached as to the divisioning of various gas-works into one of three zones. It is also reported that the Negotiating Committee are engaged in arranging a new basic rate of wages for all grades of workmen employed in the industry. In this regard, it is thought that there is a "reasonable hope" of a settlement being reached, in view of the fact that a basic rate has already been fixed for electrical workers by many corporations. If there is success in reaching an agreement, it is believed from the Union side that the workers will receive a fairly substantial increase in their present wages. This particular point may stay there for the present, so that discussion may have a perfectly smooth plane on which to run. But it may be said that this zoning and grading is going to entail a lot of anxious work; and skill and care will have to be exercised. There is no question that grading of different classes of employees for wage payment is correct. As it was before the war, so it is now. The character of the work done, and merit and responsibility, should all be recognized in payments made; and if such considerations are found in the principles applied to grading, we see no reason why the final result should be even a "fairly substantial increase" in the aggregate on the present wages. However, perhaps it is prudent that, at this stage of the discussion between the parties, there should be little comment upon this fresh phase of the situation. The gas industry wants to get on to some settled basis, so long as the basis is fair, and will assist in stopping these constant disquieting incidents, as well as excessive additions to the accumulations of burden, which are a drag on the progress of this non-profiteering industry for the prosperity of which all engaged in it should work.

It is, of course, impossible for the administrators of an industry to apply themselves with thoroughness to an improvement of its prosperity if tactics such as have been lately witnessed in the gas industry are indulged in by the Union leaders. There are shrewd men in the Federation of General Workers; and we have no doubt they realize equally with us the disturbing effect of such tactics. And the best and most generous thing we can think is that in making the additional 1s. demand, they gave way to the force exerted upon them by a ruthless and noisy minority, who have no care for anything but the inside of their pockets. When the leaders of the Federation of General Workers are allowed to operate with the independence with which their position as chiefs in a body constituted of twelve Unions, and having a total membership of 1,277,509, should endow them, they do, in many ways, develop useful policy. This last application to the gas industry came upon a settlement which was only a few months old. But we see among the resolutions submitted to the conference last week by the Executive of the Federation one which suggested an extension from four months to six months of the intervals between the submission of wage claims to employers or industrial courts. It was thought by the Executive that such a change is greatly needed for the steadying of prices, so that wage charges might be a fixed quantity during the execution of contracts. We agree with this, although hoping that periodical wage applications are not going to be a permanent fashion. Until there is some stability in wages, excesses are cut out, and production is increased, the industry of this country is going to be at serious disadvantage, and the cost of living will continue to trend in the wrong direction. It is certain that labour does not fully appreciate how much inherent power it possesses in bringing about the reduction of high costs.

To the Board of Trade or to Parliament?

THE directors or committees, with the chief officials, of most gas undertakings will be considering very seriously during the next few weeks both their position and the action they will take under the Gas Regulation Act, which will sooner or later enfold all statutory concerns. There is little doubt about this; for, although the power given to the Board of Trade is permissive, and not obligatory, to make Orders which shall govern those undertakings that do not apply for one on their own account within two years after the passing of the Act, the intention of the measure is clearly to bring about co-ordination of principles and practice throughout the industry in respect of the heat-unit basis, pressure, and other

matters. The mere fact that a supervisory and prescribing body—composed of Gas Referees and a Chief Gas Examiner—is to be established to act within the whole of the United Kingdom, and that very wide powers have been enacted which will ensure the appointment of gas examiners directly an Order is issued, show conclusively that the Act is destined to be the highway to legislative unification of the whole of the components of the gas industry. Non-statutory undertakings, too, will before long find that their interests will be better served and safeguarded by changing their estate to a statutory one. Otherwise they will not be allowed to enjoy the privileges and protection of the new legislation. The Act constructs a policy for the gas industry and conditions for gas legislation, and its intention is uniformity, subject to appropriate terms.

The first question statutory gas undertakings will be considering is whether they shall make application for an Order under the Act, or proceed to Parliament with a Bill next session. Determination will go largely in favour of applying for an Order. The Act has been so framed as to reduce very substantially the need for applying to Parliament, unless powers and changes are required which are outside the authority of the Board and the scope of the Orders (Ordinary and Special) which they may issue. We foresee a large declension of Gas Bill promotions, and so a considerable reduction of Committee-room work. The Act simplifies and cheapens the acquisition of considerable gas powers; applications to the Board will be comparatively easy; and very largely opposition can only be in respect of terms, in adjudicating upon which the Board will bring to bear their existing knowledge, and that which will be an accumulating quantity from day to day as they enter upon and exercise their new functions. There will be a great attraction in all this to proceed through the Board of Trade rather than go to Parliament with a Bill. Applications for Orders will, as was announced last week, be received by the Board on or after October 1. Therefore, those who are proposing to make early application, so as to have the power to give effect to the necessary changes as from the December reading of the gas consumers' meters, will have to consider and prepare almost immediately the details which will be necessary in lodging the application. But final shape and form cannot be given to the details until the Board publish the rules which will have to be followed and complied with when making applications. There is much preliminary work that can be done. In respect of calorific value, Parliament has adopted the principle of self-determination. Every undertaking has to determine, in its own particular circumstances, what calorific power it is going to declare at this initial stage, and which it will under penalty for infractions have to abide by as a minimum, until a change is authorized by the Board in response to an application within the conditions laid down by the Act. The price per therm which is the equivalent of that allowed per 1000 c.ft. in present Acts or Provisional Orders has to be calculated; and the details will be required to justify the reasonable addition to the price per therm for which request will be made "in order to meet the increases (if any) due "to circumstances beyond the control of, or which could not "reasonably have been avoided by, the undertakers, which "have occurred since the 30th of June, 1914, in the cost and "charges of, and incidental to, the production and supply of "gas by the undertakers." Information will also be needed by the Board to enable them to make modifications, as may appear to them to be necessary, of any provisions whereby the rate of dividend payable by the undertakers or any other payment is dependent on the price of gas supplied.

There may, on the other hand, be some gas companies and authorities who—their conditions requiring an application to Parliament—may prefer to include in a Bill the provisions which relate to the heat-unit basis of charging and price revision within the terms of the Gas Regulation Act. The South Metropolitan Gas Company—the first company to have the new powers specifically conferred upon them—have supplied a precedent for this, the main provisions of which were published in our columns last week. Clause 3 of the Gas Regulation Act also recognizes that applications for the new conditions may be made through Parliament, and not the Board of Trade. "It "shall," the clause says, "not be lawful for any person to "charge for the supply of gas according to the number of "B.Th.U. supplied, unless authorized to do so under this "Act or by Special Act of Parliament." As, however, many gas undertakings are feeling acutely the urgency of obtaining relief from their present perplexities and straits, and time is important, there may be some who, though compelled to go to Parliament for certain powers, may prefer to take a dual course by also adopting the quicker plan of securing the heat-unit basis and financial revision through the medium of an Order from the Board of Trade. Procedure in such circumstances is a matter of choice. In this association it will not be overlooked that section 10 of the Gas Regulation Act, which authorizes the issue of Special Orders, not only embraces all the powers permitted under the Gas and Water Works Facilities Act of 1870, and any amending Act, but widens those powers very considerably; and so reduces to a narrow point the need for proceeding by way of a Bill.

Should, however, there be any gas administrators who resolve to include the heat-unit and financial revision powers in a Bill, they may be reminded that it is just possible that there will be, in respect of the first applications, decisions published by the Board in time to offer guidance in preparing a Bill; and there is also the South Metropolitan model, [*ante*, p. 340,] which need not, however, be followed *literatim* or point by point. For instance, the clause limiting inert constituents need not be adopted, for that is to be the subject of further inquiry, nor need the clause be inserted providing for some consideration in respect of the super-purity of the gas. Also the basic or standard price per therm will have to be determined on the basis of the individual conditions of the applicants. There are differences of opinion, too, among gas administrators as to abandoning the sliding-scale, adopting a minimum dividend, and dividing surplus profits made at prices for gas below the basic one, in which division the employees will have a statutory right to participate. But as said on a previous occasion, we are not sure whether the powers conferred upon the Board of Trade are sufficient to permit the abandonment of the sliding-scale and the adoption of the South Metropolitan substitute without promoting a Bill in Parliament. It may be that the Special Orders section of the Act is expansive enough, incorporating as it does the Gas and Water Works Facilities Act, to allow the cancelling of the sliding-scale, and supersession by the new system. Upon this point no absolute statement can be made. But there are not a few gas administrators who regard the South Metropolitan innovation as statesmanlike and far-seeing, both in respect of the protection of the ordinary capital and the bringing of employee-workers into statutory participation in the surplus profits resulting when a price lower than the basic one is charged. We hope that it is within the province of the Board of Trade to make the substitution of one system for the other, as we feel certain that here we have a scheme that will do much to re-establish the confidence of investors, and help to put more heart and interest on the part of the employee rank-and-file into the duty of helping to promote the success of the concern which gives them employment. It is wise to legislate not only for the present but, as far as human perception will allow, for the future.

The Dividend to be Sought and Expected.

The principle underlying the portion of Clause 1 of the Gas Regulation Act that refers to the adjustment of charges is that the prices are to be raised to a level that will re-establish the pre-war financial conditions of the undertakings. There is to be such addition to the standard or maximum price as appears to the Board of Trade to be reasonably required in order to meet the extra costs produced by circumstances beyond the control of, or that could not reasonably have been avoided by, the undertakers. From this a fair corollary is that the price per therm will be put at a figure that will allow the dividend payable on existing ordinary stock to be at least equal to that which the undertaking was paying on its ordinary stock before the war. Even then the share or stock holders will be losers to a substantial degree. The credit of the industry has been deplorably impaired; the return of dividends to the pre-war rate per cent. will not, with the intrinsic value of money what it is to-day, restore to the shares and stocks the market values of 1913-14; and at the time there were good expectations that the charges for gas would be further reduced, and so dividends under the sliding-scale would ascend. Now under the Act the Board of Trade have power to make such modifications in the dividend payable as may appear to them to be necessary; and we think it may be safely said that what will appeal to the Board as necessary will be to

institute conditions that will give to the existing capital, at the new standard price per therm, the pre-war dividend, and no more. That is the dividend—not that we are impressed by it in the circumstances of to-day—to which, we think, gas undertakings must look, and to obtain which they must make their calculations. We gather this from what Mr. Bridgeman, the Parliamentary Secretary to the Board of Trade, said during the progress of the Bill. On second reading, in the House of Commons, he intimated that the result of the financial readjustments would have the same profit-earning capacity as the undertakings had before the war. Then when the Bill was before Standing Committee A of the House, Mr. Bridgeman said it was the intention that gas companies should be in the position to pay a dividend as before the war; and there was no wish to interfere with the sliding-scale. From these statements restoration of pre-war dividends is clearly the idea of the Board.

But what was in their minds was evidently not in those of the members of the House of Lords Committee who considered the South Metropolitan and the South Suburban Bills—true before the Gas Regulation Bill was published, and therefore before Mr. Bridgeman had had an opportunity of making a pronouncement as to the views of the Board on the point. In both the Private Bills, 6 p.ct. was sought on the ordinary capital; but the Lords Committee reduced the dividend to 5 p.ct. on the existing capital, while allowing the 6 p.ct. on future issues of ordinary capital, to make it more attractive to the investing public. But the 5 p.ct. on existing ordinary stock was totally unfair, seeing that the South Metropolitan Company's dividend before the war was £5 9s. 4d., and that of the South Suburban Company 6 p.ct.; and these are the dividends paid per cent. of stock for which, by most existing holders, a premium had been paid. The South Suburban Company withdrew the heat-unit and financial revision clauses from their Bill; and in the interests of the existing stockholders, the Chairman (Mr. Charles Hunt) and the members of the Board were wise. The Company will now pursue the ordinary process of applying to the Board of Trade; and it is certain that the Board will mete-out to the Company the same treatment that they will do to other companies. Dr. Carpenter and his colleagues of the Board of the South Metropolitan Company, on the other hand, did not withdraw the heat-unit and financial revision clauses; and probably the determining factor with them was that they did not know what in that event would happen to the scheme which is in their case supplanting the ordinary form of sliding-scale, and to which allusion is made in the preceding article. This scheme they did not wish to jeopardize or sacrifice; and so in all likelihood the choice lay between the acceptance of the 5 p.ct. on the existing stock and the statutory recognition of the novel surplus profits scheme. Such a favourable opportunity for obtaining this recognition might never have occurred again. Policy therefore dictated the acceptance of the 5 p.ct. We see no reason, however, why this acceptance should be more than a temporary matter, if other companies secure on existing ordinary stock conditions which will allow their pre-war dividends; for it will be quite open to the Company to ask later on for an amendment (if what we anticipate will be done is done) which would place their existing stockholders in the same position as those of other companies in respect of dividend. It would be unfair that dissimilarity between the general practice of the Board of Trade and an individual decision of a Committee of the House of Lords should exist, or should be perpetuated; and more especially seeing that the principle underlying the General Act has since been endorsed by both Houses.

Coke Supplies and the Coal Strike Menace.

WHEN the great coal strike took place in the early part of 1912, it lasted a full six weeks; but supplies were disturbed for practically three months. When output recommenced, there was a rush from industries at home and from purchasers abroad for not only the coal to carry-on with from day-to-day, but for coal to replenish stocks. At that time industries and electricity stations welcomed anything in the way of fuel of which they could get hold; and among other sources of fuel supply, the previously much-despised gas coke had extensive demands made upon it to generate electric current. Then a large part of the experience was bad; and the reputation of coke for steam-raising purposes was not much improved among electrical men. At that time their furnaces were not suitably fitted for its utilization. Proper forced draught and feeding arrangements were not part and parcel of the furnace equipment. Since then that best of all teachers—experience—has shown what to do, and the valuable efficiency advantages there are in using at any rate a stratified bed of coal and coke under boilers. Now coke has a firm place in boiler-firing from which it will not be dislodged, and its use will extend. If the threatened strike of miners matures, there will be a very large demand for gas coke from electricity stations; and so there will be from other quarters. The duty of gas-works, however, will be to supply first themselves with all the coke that will help to conserve their coal supplies; they will then look after present and constant customers, among whom will be the existing coke-using electricity stations; and the electricity stations which have hitherto not been customers will have to take their chance among other casual buyers. We have no doubt all export coke will, in the event of a coal strike, be stopped. There has been a wonderful spurt in the demand for coke from abroad. In the seven months ending July, 1,144,234 tons were exported, compared with 599,275 tons in the corresponding period of 1913. This boom in the demand from abroad, at high prices, has meant a considerable increase of revenue to exporting gas and coking works. But, as the figures indicate, the stopping of the shipment of coke will not make a big supplement to fuel supplies at home. What it will do will be to upset the calculations of those gas undertakings that have been budgeting upon a maintenance of their bulky receipts from coke for continuing a low price of gas. The adventitious circumstance of being able to ship coke abroad has, through the high prices obtained, given them an advantage which has made the price of gas in other areas appear relatively high. Yet the percentage increase in the price of gas is, generally speaking, lower than any other commodity—secondary products, larger gas production per ton of coal, and the deprivation of the holders of capital in the industry of a fair return upon their money, being the causes that have operated to this end. As to the fresh menace of a coal strike, some notes appear in other columns.

The Secretary of Mines.

The experience the gas industry has had of Mr. Bridgeman, the Parliamentary Secretary to the Board of Trade, in connection with the passing of the Gas Regulation Bill through Parliament will ensure for him a hearty welcome on his appointment as Secretary of Mines under the Mining Industry Act. He is one of the most popular members in the House; and his manner of dealing with men and matters has caused him to be so. He has, through his work at the Board of Trade, obtained a good insight into the difficulties of the gas industry; and he knows that the most pronounced trouble has been coal—its price, supply, and quality. He is approachable; and, when in difficulty, the gas industry is bound to find in him a good sympathizer and helper so far as is humanly possible, and discretion and consideration for others will allow. The King has been "pleased to approve that Mr. Bridgeman be sworn of His Majesty's most Honourable Privy Council on the occasion of his appointment as Secretary of Mines." Major Sir Philip Lloyd Greame, K.B.E., M.C., M.P., is to be the successor in the office of Parliamentary Secretary to the Board of Trade.

Gas Coal Stocks and the Strike Threat.

With heavy clouds banking over the coal industry, we hope a statement made by the Coal Controller (Mr. A. Ray Duncan) to a Press representative last week applies to every gas-works in the country. He said: "The public utility services—gas, electricity, water, and railways—are very well stocked. But here, again, the stocks hardly compare with pre-war quantities, and with a cessation of supplies they will rapidly dwindle." The second part of the statement is true, and we hope the first part is so in its application to every gas-works in the country; but there are doubts so far as the small and more distant ones are concerned. But the Coal Controller has been working hard in raising stocks; and acknowledgment is due to him for what he has achieved, though stocks are still below pre-war normal.

The Miners' Position.

The demands over which a strike is threatened are well known the fact is also obvious that a national coal strike will successfully

dissipate the millions of profits from coal exports (and an incalculable amount besides), for sharing in which the advanced leaders of the Miners' Federation are urging the miners to vote for a strike. It is also common knowledge that the miners were never in such rich clover as they are at the present time. The position cannot be too widely known, nor the facts too well borne in mind. The miners have obtained advances in wages since 1913 averaging 160 p.ct., whereas, taking into account the free or cheap coal they receive, the cost of living in their case has not risen more than 145 p.ct., compared with 152 p.ct. for workers in other industries. It is noticed that the 160 p.ct. is based on an average; and some of the miners are earning large wages, combined with which is the shorter working day. The men are not working so diligently as they did formerly. In 1913 the number of workers in and about the mines was 1,110,000; and now 1,206,000. The output in 1913 was 287,500,000 tons; and it is estimated that this year it will be about 240,500,000 tons. Though nearly 100,000 more men are employed, the output is down by 47 million tons.

Other Workers and the Threatened Strike.

Those are facts that should be remembered by all, and particularly by the workers in other industries, which are dependent upon coal. The cheaper and more plentiful it is, the better for the workers personally in their domestic life, and the better for them in the industries which give them employment. High prices for coal and diminished output are having a hideous effect upon the general fortunes of the country; and this is not good for the workers' comfort and continuous employment. Should the miners decide to accept the recommendation of their leaders and vote for a strike, they will be doing something which they know full well has no genuine warrant behind it, and which will work grave injury to those employed in other industries. But the miners—in large part good enough men themselves—are guided by revolutionaries, who have no care for any one else so long as they can by any means attain their objective, however wild it may be. The Miners' Federation are hoping to get the active support of the other members of the Triple Alliance—the railway men and the transport workers; but there are not wanting signs that these organizations will offer not active support, but mediation with a view to bringing about a settlement. It is a pity that the other trade unions of the country do not tell the miners plainly that they have gone far enough, and that the time has come to moderate their "grab-all" and perpetually disturbing policy.

Strike Time-Table.

In an article by the Parliamentary Correspondent of the "Daily Telegraph" on the threatened strike, it is stated that the following are expected to be the important dates preliminary to the struggle, if there is to be one: Return of ballot results, Aug. 30; meeting of Triple Alliance, Aug. 31; national conference of miners' delegates, Sept. 2; strike notices handed in, Sept. 4; strike notices expire, Sept. 18; strike begins, Sept. 20.

Terrorizing the Credulous.

We do not know who is responsible; but it looks very much as though the super-gas refiners are commencing operations in working on the nerves of the public in order to secure the pressure of public opinion at the inquiry, which is provided for in the Gas Regulation Act, into the question of the limitation of inerts and carbon monoxide. An article on the subject has appeared in the "Daily News and Leader," and we know very well that that paper would not have been likely to print such an article without inspiration from some source inimical to the gas industry. The points made and the manner of their presentation indicate this; and we have no hesitation in labelling the performance as malicious. The article is anonymous; so that the source of inspiration is not known. The person or persons constituting that source apparently is or are afraid to allow fair play in discussion before the tribunal the Board of Trade will set up to inquire into the matter. Both sides will have their opportunity then; and trying the preliminary game of working upon the nerves of people who cannot themselves possibly bring competent judgment to bear upon the questions at issue is playing at something that is as repugnant as hitting below the belt.

The Bogeys.

The article is headed "Dearer Gas Soon—Harmful to Health and Poor Quality." Little is said about the gas being dearer. Even the dullest intellects in the community appreciate that coal, labour, and materials cannot make flights in costs as they have been and are still doing without the price of everything that is manufactured by and from them also ascending. And the price of gas has not risen by the same average percentage as other things have done. The remark is made that "it may be roughly stated that the cost to the consumer will be double the pre-war rate." What is there that depends on coal, labour, and other materials for its production that has not doubled, and more than doubled, in price? As to the new hypothesis regarding the noxious effects of the gas that will be supplied in future. Before rubbing-in the toxic quality, the safeguarding observation is made that "the gas *may* prove harmful to national health." There is obvious cunning in the "may." Of course, carbon monoxide is the toxic property, and inerts are alleged to impoverish the gas. It will be for those who make the allegations to show that since the Home Office inquiry of over twenty years ago, with the growing use of water gas, there has been a greater proportion of fatalities owing to gas poisoning in this country, and that the death rate in America from this cause is greater where larger percentages of water gas are supplied than here, and in some places neat water gas. Practical experience must count in any inquiry into such a matter, and so must the question of the supply of an economical gaseous fuel. The allegation as to leaky pipes in poor quarters is mean; because the instigator or instigators of the article know very well that, if pipes were in that condition, there would be constant trouble from explosions, and there is not. As to inerts under the heat-unit basis, the consumer will only pay for the potential heat supplied, and not for incombustibles. Investigation has been enlightening responsible men on this subject, and the results of investigation will be brought forward at the inquiry. Moreover, the gas industry is not governed by imbeciles, who propose to do something that will retard progress, and perhaps diminish very largely the volume of business. The imbecility is manifestly located elsewhere. We are surprised at one of the London morning papers lending itself to underhanded work of this kind without inquiring more particularly into what is to be said on the other side.

PERSONAL.

The King has approved the appointment of Mr. W. C. Bridgeman, M.P., to be Secretary of Mines, and of Major Sir Philip Lloyd-Greame, K.B.E., M.C., M.P., to be Parliamentary Secretary to the Board of Trade. The King has also approved that Mr. Bridgeman be sworn of His Majesty's Most Honourable Privy Council on the occasion of his appointment as Secretary of Mines. After the election at the close of 1918, Mr. Bridgeman was appointed Parliamentary Secretary to the Board of Trade.

The Gas Committee of the County Borough of Stoke-on-Trent have unanimously appointed Mr. Gilbert Surtees to the position of Assistant Manager in charge of their Fenton works. Mr. Surtees served his apprenticeship with Messrs. R. & J. Dempster, and has had experience in the workshops, outside erection, and drawing office. He was first prizeman in his year in mechanical engineering, and holds a first-class honours certificate in "Gas Engineering" (City and Guilds of London Examination). Mr. Surtees is the son of the Deputy Gas Engineer of Stoke-on-Trent.

OBITUARY.

Mr. G. W. Houston, who died on the 6th inst., aged 55 years, was well known among gas engineers and others in the Manchester district, and was held in very high respect. A thoroughly capable engineer, he was for many years Manager of the Gas Department of the London and North-Western Railway Company at Crewe; and, in addition to his duties there, he acted as Engineer of the Company's gas-works at Wolverton. Among those who attended the funeral was Mr. G. S. Frith, the Hon. Secretary of the Manchester District Institution of Gas Engineers.

Temporary Increase of Charges Act.—There have been issued by the Ministry of Health, under the Statutory Undertakings (Temporary Increase of Charges) Act, Orders authorizing the Ossett Corporation to increase the maximum price of gas from 5s. (under a previous Order) to 6s. per 1000 c.ft.; and the Portland Urban District Council, from 5s. to 7s. 6d. per 1000 c.ft. Applications for Orders have been received by the Ministry from the Doncaster and Torquay Town Councils, and the Ashbourne, Coalville, Denton, Newtown and Llanllwchaiarn, Sidmouth, and Spalding Urban District Councils.

ELECTRICITY SUPPLY MEMORANDA.

JOINT electricity supply authorities are being formed in the country, counter-schemes for generating current are being put forward by large municipalities and power companies in the same areas, and the Electricity Commissioners have their hands full. As yet nobody knows, or can know, whether all this is going to produce a more efficient and economical supply of electricity. The Bath Town Council have their doubts and fears; and they are led in this by Sir Harry Hatt, the Chairman of the Electricity Committee. This gentleman's view appears to be that the work is all being done the wrong way about by forming joint authorities before getting out plans, and showing what is the technical and commercial programme, and what are the probable results. We do not agree with him, other than to a very limited extent. Quite the proper thing is to get the joint authority together, and then to utilize the combined intellectual strength to decide upon the scheme that is to be developed. But we clearly see Sir Harry Hatt's point. What is really troubling him is that, becoming a member of a joint authority before knowing what is going to happen, is simply to take a leap in the dark. It will not be possible for local councils who are members of a joint authority, and who disapprove of the scheme ultimately decided on by the majority, to withdraw from it. If any did, it would mean that there would never be finality, and the integrity of a scheme would be sadly impaired. The whole scheme would then have to undergo modification. However, the Bath Council are not going to take up a position antagonistic to the formation of a joint authority, but will offer every possible assistance in furthering any scheme for securing a cheap and abundant supply of electricity within the south-western area. But they have a doubt as to the fruit that is to be gathered from it all being of the efficient and economical kind. Much money will undoubtedly have to be spent over this as over other combined schemes; and there is nothing to show that the money will be more profitable than the money that would be expended in developing the local generating plants. A site has been chosen for a super-power station. It is known as the Beachley site; and, in Sir Harry's opinion, it is lacking in certain essentials for the purpose for which it is destined. It is plain the Bath Council believe they are being drawn into something that will not be for the good of the city; and they feel that they will have to be extremely careful before they pledge themselves to membership of the proposed authority. If there are many local authorities who take up the attitude of Bath, the Electricity Commissioners may feel the need of the compulsory powers that are in the Bill the Government have put on one side for further consideration and perhaps modification.

Doubts and Fears.

There is another thing that is becoming rather noticeable in connection with the new schemes of electrical generation. It is that the consulting and advisory work is finding its way into the hands of comparatively few men—clever no doubt, but still they do not possess all the brains, ingenuity, or imagination that are to be found in the electrical profession. There is in this danger of stereotyping. The electricity industry has often bitterly complained that one of its greatest drawbacks since the beginning of the eighties was the division of the country into electrical areas bounded by the limits of local jurisdiction. Uneconomy has been the result. Now if in connection with electricity generation reorganization designs and plans are to be confined to the hands of a few men, in the years to come there may be complaints that the organisms of large power stations possess such similarity that the country has in this particular been robbed of flexibility in the gathering of experience and in producing improvement. It would be much better if greater play were given to the design of stations by more men, and intelligences being brought to bear upon the work, than to commit the industry very largely to a few grooves which it will have to follow for many years to come.

More Men Greater Flexibility.

It is hoped some day to realize a lower cost for gas apparatus by the process of standardization. There has been a good deal of talk about this lately; and it is claimed from the manufacturers' side that one step towards this (as it will result in mass production) is the fusion of certain prominent firms. The electrical people are ahead of the gas industry in the matter of a specification for standard electric cookers. The British Engineering Standards Association have issued one; and it is the first effort to introduce standardization for appliances the heating agent for which is electricity. Two sizes of cookers have been subject to specification; and each range is dealt with in two parts, so that the specification includes two sizes of cooking-table and two sizes of oven. One size is intended to serve for the cooking for five persons, and the other for ten. The cooking-tables provide hot-plates and a grill, with a space to act as a warming chamber. It is hoped that the experience gained will enable revision to be made a year hence. Among those who collaborated in the preparation of the specification were the British Electrical and Allied Manufacturers' Association, the Incorporated Municipal Electrical Association, and the National Electrical Contractors' Trade Association. One comment upon the specification that is worth reproducing here is found in the "Electrician." It says: "At the stage which electric 'cooking' has now reached, it is desirable that there should be a series of rules for its construction [*sic*], compliance with which would represent good practice; the rules being more in the nature of a 'bogey' than an ideal."

Standard Electric Cookers.

The manufacturers of electrical appliances have been devoting a large amount of attention to the smaller class of heating and cooking appliances in preparation for the coming season. There is not any great demand for the larger appliances; the obstacle no doubt being the price of B.Th.U. supplied electrically. While in the smaller lines of goods there will be available a number of new models, the "Electrical Times" is not aware that there will be any "striking departures" from established practice. The electrical industry is fully conscious that present conditions are not favourable to a large campaign for cooking and heating business with current prices as they are, both for the apparatus itself and for the current. There must be a care on their part that they do not do untold mischief to their lighting business by fostering to any large extent the utilization of the smaller heating and cooking appliances off the lighting circuit, with electrical energy at the price it is to-day. Charges for lighting at 8d., 10d., and 1s. per unit—even 1s. 2d. is spoken of—are not of a kind which should lead to encouragement of the use of electrical appliances off the lighting circuit. If there is, and it is successful, there will be a splendid crop of dissatisfaction when bills are delivered, and permanent harm will be done to electricity undertakings to the benefit of the gas competitors. We see among the small appliances described in the electrical papers, kettles, irons, food and milk heaters, combination saucepans, small boiling-plates, &c. One kettle is noticed, the loading of which is 600 watts, for use off a lamp-holder. Its capacity is 2½ pints; and the boiling point is reached in fifteen minutes, at a cost of 1·33d., with current at 8d. per unit. This is expensive for boiling such a small quantity of water. Another kettle is spoken of, with self-contained 700-watt element. This, it is calculated, will boil 2 pints of water in ten minutes starting from cold; and with electricity at 8d. per unit, the current would cost about 1d. That is the calculation of the "Electrician," which thereby accords the kettle 100 p.ct. efficiency, if the water is taken at 50° starting cold, and is raised to boiling-point. Our contemporary makes this vacuous remark regarding the penny for boiling 2 pints of water: "At first this seems an exorbitant figure; but when it is realized that the price of gas has also advanced in equal proportion to electricity (because both are dependent on rising charges for labour and coal), the cost of so boiling water is not prohibitive." Putting this statement to the test of figures (the accuracy of which can be demonstrated), gas at 4s. 8d. per 1000 c.ft. will for 1d. give 9000 B.Th.U. With a gas boiling-ring, it is easy enough to get 50 p.ct. efficiency, so that the pennyworth of gas would boil between 2 and 3 gallons of water—not pints, but gallons! With the higher efficiency geyser, much more work would be done for 1d.; but that is another matter. However, our contemporary recognizes the danger of recommending the use of radiant hot-plates of 750 watts or over on the lighting circuit. To boil 2 pints of water in an aluminium kettle on a radiant hot-plate loaded to 1000 watts would take thirteen minutes, and at 8d. per unit would cost practically 1¼d. It advises that the price of electrical energy should be considered before recommending consumers to use radiant hot-plates, small grills, &c., off the lighting circuit; and it also warns against the practice of installing such things on lighting circuits incapable of feeding them. From this, difficulties of all kinds must result; and, as our contemporary says, progress will be retarded. This is only commonsense; but in some industries there is, as among individuals, a proneness to self-damnation.

Heating Off the Lighting Circuit

Parliament ought not to give statutory rights to crudeness and inconsistency as between consumer and consumer. Supply without a meter, and all the various methods of charging by which consumption registration is largely or wholly sacrificed, must result in differential treatment in respect of payment for the service rendered; and this is opposed to the General Acts, which provide that undue preference is not to be shown. Undue preference would be shown where it could be demonstrated that, through one or other of the freak systems of charging, a consumer was getting similar service for a lower payment. The matter of supplying without meters crops up again in connection with the use of electric light in the housing schemes; and the following interesting contribution to the question was lately made by the "Electrical Times:" An echo of recent discussions concerning systems of supplying electricity without meters was heard later in the Parliamentary Committee Rooms when the Bill of the Londonderry Corporation was under consideration. This Bill contains a clause giving the Corporation the right to supply any house up to a rateable value of £60 without a meter. The Corporation's trouble seems to have been that any consumer could demand a supply through a meter under the ordinary Provisional Order powers, and that the evidence of such a right might interfere with the development of electricity supply to the artizans' houses which were then being erected. It was also hinted to the Committee that in the present state of affairs,

Meters and Artizan Dwellings.

rateable value, fixed price light, and similar systems were more or less illegal, by virtue of the fact that the consumer had the right to demand a supply through a meter. Londonderry proposes to erect 1500 houses, and expects to save £7500 on the capital cost of meters, while the consumer will save his meter-rental. This appealed to the Committee; and the proposal was passed. Our contemporary would be interested to hear arguments upon which the illegality of the fixed price light system, or rateable system, or any system without a meter, is based. Anyhow, it cannot recollect any case in which objections have been made on this basis. The current limiter system, it submits, is most desirable for artizans' houses, especially as meters are difficult to obtain.

Transmission Lines and Breakdowns.

When electricity generation gets more concentrated, and there is larger dependence upon transmission lines, there will be more scope for breakdowns. Bingley is supplied with electricity by Keighley, and recently there was a prolonged failure of supply—lasting for some 27 hours—through a fault in the transmission line. This is not the only failure that has been experienced by Bingley; and on this and other occasions all classes of consumers and the tramways have been bad sufferers. On the last happening of the kind, it was only through Shipley coming to the rescue that the tramway service could be continued. There is going to be a fuss over the constant interruptions of supply, as the Bingley Council have been proposing to approach everybody who they think has any authority in the matter—the Board of Trade or the Electricity Commissioners are mentioned. The Council are desirous, if satisfaction is not obtained, to have an independent arbitrator appointed, under a clause in the supply agreement, to settle matters as between themselves and Keighley. Transmission lines are not without their dangers and troubles.

SIXTY YEARS AGO.

[From the "Journal" for August, 1860.]

Early Days of Gas Capital.—The great public works companies of England, especially of London, established without the slightest pretensions to patriotic motives, and carried on without the slightest claim to public gratitude, have, at any rate, a claim to public justice. They are as much public institutions for the benefit of the country as the Post Office, with this essential difference—that the public purse bears the risk of Government undertakings, political influence selects the working staff, and political influence is used to conceal and defend every abuse. But a gas company, a water company, or a railway company begins by embarking a capital which no private firm would risk, frequently works for years without any or very insignificant dividends, and as soon as it achieves success, and requires increased powers to supply the demands of its customers, inevitably comes under the reviewing power of Parliament, and not unfrequently of the confiscatory attempts of parish agitators. The risks, the difficulties, the minute dividends of former years, are forgotten. No one thinks now of the cost and quality of the old water-carriers' barrels, the flickering oil-lights, or costly wax-lights of our fathers' days, and all that has been gained in money and time by the speculation of the "Giant Monopolists." To any intelligent foreigner, and to any Englishman not being a professional parish agitator, it would seem a subject for national pride and congratulation that private enterprise had found £500,000,000 sterling to invest in gas, water, and railway works, especially when it is known that this vast sum, the representative of enormous public convenience and commercial profit, yields on an average less than 4 p.ct., and has been raised under stringent provisions for the protection of the public.

The only proper inquiry would be whether companies had performed their part of the bargain, and supplied the quality and the quantity at the price fixed when they undertook the risk of the investment, and obtained in return for the risk the concession of a limited monopoly. But there has arisen of late a school of Parochial Robin Hoods, whose profession it is to plunder public companies for the assumed benefit of a parish, and be paid for the job, or the attempt. In the eyes of these "Men of Belial," the guilt of a company does not depend on the way in which it performs its duties, but on the amount of its capital and the rate of its dividends. "Come," they cry, "here's a great rich company, their capital is £1,000,000, and they have lately paid 6 p.ct. Let's make war on them, and we are sure to get something out of them, if we only complain long enough and loudly of being 'down-trodden by a gigantic monopoly.'"

Manchester and District Junior Gas Association.—Arrangements have been made for the members to visit next Wednesday afternoon [Sept. 1] the Lancashire and Yorkshire Railway Company's locomotive works at Horwich. After tea, Mr. W. H. Battersby, of Bury, will read the "Chemical Notes on Gas Manufacture" which are reproduced on another page of this issue. Subsequent meetings of the session (with papers) will take place at Stretford, Oldham, Bolton, Leigh, and Blackpool. Mr. J. Bridge, of Bolton, is President; and Mr. J. Alsop, of the Lum Street Gas-Works, Bolton, is Hon. Secretary.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS

Programme of the Annual Meeting.

The Fifty-Ninth Annual Meeting of the Association will be held on Thursday, Sept. 2, in the rooms of the Institution of Engineers and Shipbuilders, No. 39, Elmbank Crescent, Glasgow, under the presidency of Mr. R. W. Cowie, of Port Glasgow. The chair will be taken at 10.30, when formal business is to be transacted. The President's Address will be followed by two papers—by Mr. S. B. Langlands, of Glasgow, on the "Gas Regulation Act, 1920," and by Mr. T. W. Harper, of Ayr, on the "Reconstruction of Vertical Retorts."

A dinner that evening has been arranged for members and lady friends; and the excursion the following day will take the form of a steamer trip to Inveraray. During the dinner Mr. J. W. Napier, of Alloa, is to be presented with a testimonial.

Report of the Council.

In their annual report, the Council state that the membership of the Association at June 30 last was 261, compared with 258 at the close of the previous year.

Mr. R. W. Cowie has been appointed to represent the Association on the Council of the Institution of Gas Engineers for the year 1920-21.

The report of the Western District Commercial Section (signed by Mr. David Fulton, the Hon. Secretary and Treasurer) states that explanations on different matters given at the meetings have been of great service to the members. There are now fifty-two undertakings in membership.

The membership North-Eastern District Commercial Section stands at forty-eight. The Secretary (Mr. R. S. Johnston) reports that many prominent matters have been discussed. During the session there have been five meetings, held in different towns.

The Official Analyst to the Association (Mr. G. H. Gemmell, F.I.C.) reports upon a number of analyses made by him.

The amount at the credit of the Benevolent Fund is £918. No application for assistance from the fund was made during the past year.

Subscriptions to the Research Fund for the year amounted to only £4 3s. 6d.; and the balance has been reduced to £5 4s. 7d. The Council point out that the expenses chargeable to this fund amount to a minimum of £10 10s. per annum. A subscription of one shilling per member would maintain the fund in a solvent condition; and it is hoped members will give the matter favourable consideration.

The Council regret to state that, owing to the continued extraordinary increase in cost of requirements under the General Fund of the Association, for this year it will be again necessary to transfer temporarily the sum of £35 2s. 9d. from the revenue account of the William Young Memorial Fund to the General Fund of the Association, to make good the deficit on last year's working. This sum, along with the sum transferred last year, it is expected will be refunded during the present financial year, due to the increase in members' annual subscriptions.

During the year, Mr. Peter B. Watson (the Secretary and Treasurer) intimated his resignation, to take effect at the end of the financial year—*i.e.*, June 30, 1920. The Council have accepted Mr. Watson's resignation with regret, and agreed that he should become an honorary member of the Association.

The Council have unanimously appointed Mr. David Fulton, Gas Engineer, Helensburgh, to the post of Secretary and Treasurer of the Association.

Proper Care of Crucibles.

It is pointed out by Mr. Edward F. Davis, in the American "Gas Age," while writing on the efficiency and low cost of gas fuel for brass melting, that the life of a crucible is almost as important as the cost of melting, and that anything which tends to shorten this life should be given serious consideration. In connection with a crucible, the most important thing in melting is to use a reducing flame, and to see that the crucible has been properly annealed and cared for prior to its use. Crucibles are free from moisture when they leave the manufacturers' kilns; but they absorb moisture very readily if not protected. If a damp crucible is used, and put directly into a hot furnace, or if it is heated too quickly, the moisture in it will be changed to steam so rapidly that small pieces of the crucible will be blown off bodily. This is known as "scalping;" and to prevent it, the crucible must be annealed by raising it from room temperature to about 225° to 250° Fahr.—this rise being gradual, so that the water may be driven off slowly. The crucible should then always be kept in a warm, dry place. Crucibles are also injured by packing them full of cold ingots or scrap, which expand as they are heated to the melting-point. The crucible does not expand as much as the metal, and strains may be set-up which crack or weaken it. If crucibles are not allowed to cool down very much, but are kept hot continuously, so that there is less expansion and contraction, their life is lengthened. This is one reason for the longer life of crucibles in tilting than in pit furnaces. The continuous operation of crucible furnaces is unusual; but if the empty crucibles are promptly put back into the furnace, and allowed to cool gradually with it, the serious deterioration due to excessive expansion and contraction may be minimized.

SWISS SOCIETY OF THE GAS AND WATER INDUSTRY.

AMERICAN GAS-WORKS PRACTICE.

At a Special General Meeting of the Swiss Society of the Gas and Water Industry held at Zurich in January last, the principal item on the programme was a series of reports on various phases of the gas industry in America which came under the observation of delegates of the Society in the course of a tour made by them in the United States during the summer of 1919. The delegates were MM. H. Zollikofer, F. Escher, H. Lier, K. Meier, and G. E. Ernst. The chief of these communications, which have just been published by the Swiss Society, is that of M. Zollikofer, which deals with gas-works practice in the United States, and of which a somewhat abridged translation follows.

A Report by Engineers of the Swiss Society of the Gas and Water Industry.

M. Zollikofer advisedly discards any geographical plan of recording his observations, but divides his report into a number of sections dealing respectively with gas-works, systems of distribution, natural gas, and the prevention of accidents.

The Gas Undertakings of America.

Under the first heading, he briefly represents the dimensions of the American gas industry according to the figures for the year 1918: Number of gas companies, 1029; number of consumers, 8,159,400; population in districts of supply, 45 million; gas sold, 7450 million cb.m.; invested capital, shares (1917), 1856 million dollars; debenture stock (1917), 1610 million dollars. Of the total gas sold, 12·5 p.ct. is coal gas from retorts, 45 p.ct. carburetted water gas, 4·5 p.ct. oil gas, and 38 p.ct. coke-oven gas. The New York Consolidated Gas Company in 1918 sold 367 million cb.m. of gas.

Thus the gas industry in America is highly developed, and is wholly in the hands of private companies, who very frequently also own or control the electric supply undertakings. A notable feature of the works is their efficient character, as shown by the simple design of the buildings and plant. Wherever buildings are not required for the protection of plant or workmen, the installations are in the open. On the other hand, the administrative buildings are often of a most elaborate kind. Almost all the companies own works producing both coal and water gas; while others, supplying several millions of the population, manufacture only water gas.

Most of the companies are working under contract to supply a gas of somewhat high illuminating power—as a rule, of 18 to 22 English candles, and of a calorific value of about 5350 calories gross per cb.m. The works have great difficulties in maintaining these standards, particularly when substituting gas produced in coke-ovens or by other modern processes for coal gas. At the time of the tour, the price of gas in large towns had risen to about 15 c. per cb.m.

Water-Gas Plant.

In considering the manufacture of water gas, it is to be understood that this latter is carburetted with oil, which is the only means of fulfilling the contractual requirements just mentioned. The modern development of water gas dates from about the eighties of the last century, when the United Gas Improvement Company successfully introduced in America improvements in the Lowe system, which had already been used in Europe in the Humphreys and Glasgow plant. America is pre-eminently suitable for this process, owing to its inexhaustible supplies of mineral oil and anthracite coal. The conditions of price which hitherto have greatly favoured the manufacture of carburetted water gas have been modified by the war and by the increasing demand for oil. The price of the latter has risen from 2¾ c. to 9 c. per kilo, while coke has increased in price from 20 to 50 frs. per ton delivered at the works. Moreover, the prices of coal have undergone very great variations and have increased in large measure.

In these circumstances, there seems to be a tendency in the United States gas industry to lay-down coking plants for itself, or to buy coke gas and to supply a certain proportion of coal gas, while making up the balance with water gas. This policy is largely dictated by the fact that water-gas generators are much more economical of labour than retort-furnaces. One workman can supervise a plant equivalent to several furnace benches requiring a number of workmen, while the expenditure of heat is relatively small, and the troubles of smoke and sooting are eliminated.

For the production of water gas, two descriptions of plant are used. That known as the "Three Shell Machine" of the United Gas Improvement Company comprises the three elements of producer, carburettor, and superheater, and is the one most extensively used. In the "Union Shell" or Williamson machine, which is of more recent introduction but widely used, the carburetting and superheating units are installed in the producer. The only advantage of this second system consists in the smaller area of ground required for the building. On the other hand, the labour required by the producer and for the removal of clinker from the furnace is a drawback; and the considerable height of the installation likewise adds to the labour required.

The old water-gas plants work with a relatively low air-pressure of 400 mm. to 500 mm. of water, while the modern installations work up to 1000 mm. and have a much greater production for a given sectional area of the producer.

The delegates did not see any of the mechanically revolving grates for the removal of clinker, but inspected the rolling pattern of grids introduced in the modern producers. These consist of a number of parallel shafts of square section operated by endless screws. On the shafts are arranged solid discs of small size alternating with larger notched discs; these latter serving to break-up the clinker and pass the fragments into the ash-pit. It appears that these grids give every satisfaction.

An excellent piece of plant was seen to be the falling grids installed in the producers of other water-gas works in New York and Chicago. By lowering the grid, the clinker can be very easily and rapidly removed. The grid is raised again immediately by a lever.

Recuperative chambers for retort-furnaces were not generally seen, but many of them came under inspection in water-gas installations. Boilers are heated by the waste heat obtained from the gases. At the Astoria works in New York it was stated that the steam thus raised represents about a quarter of the total steam required in the manufacture of the water gas and for the blowing plant. But there is no doubt that the working of these recuperators involves many kinds of difficulties. The boilers and the whole water-gas plant are provided with valves as a preventive of great damage in the event of explosion.

In the large works the producers range in diameter from 3·3 to 3·6 m. They are able to yield 60,000 to 85,000 cb.m. of gas per twenty-four hours. In Twenty-First Street, New York, a battery of thirteen producers supplies about one million cb.m. per twenty-four hours.

The raw materials are coke and anthracite on the one hand, and oil gas on the other. Coke is used when the works are producers of it, or when transport facilities favour its employment. But anthracite is preferred in all cases in which its transport is cheap, since its greater weight per unit volume intensifies the yield from the producers. In Chicago 56 to 58 kilos. of coke and 43 kilos. of oil-gas are used for the manufacture of 100 cb.m. of water gas.

The conveyance of the fuel from store is done in several ways. In the Astoria works the coke is raised into bunkers placed in front of the producer building by means of conveyors; and thence it is delivered right into the producers by telpher plant. The charging boxes are brought on to the producers by elevators. In the works of the People's Gas Light Company of Chicago, trains of from four to six wagons arrive at the floor of the producers along a gradient of about 8/100 by means of Ford tractors. These latter are used for their great convenience on any required route, and for their speed and flexibility on both up and down gradients.

Steam for the water gas is raised in tubular boilers—those employing solid fuel being provided with chain-grates. In many works—for example, those in New York—the boilers are fired with water-gas tar, which is of little value for sale. The tar is atomized for combustion by a jet of steam or compressed air.

Much stress is laid on having the steam dry and superheated. At Detroit, the steam is used at 0·3 atmosphere and 180° C. The supply of blown air is usually produced by fans made by the Sturtevant Blower Company, of Boston. They are operated by electric motors, or very frequently by the steam turbines of the Therry Steam Turbine Company, of Hartford, Conn. The exhaust steam of the turbines is frequently utilized, after having been superheated, in producers for making the gas. This method is a very practicable one in plants where several units are in work at the same time, and where this steam is collected. The receptacle into which it passes is supplied with the necessary quantity of fresh steam by means of an adjustable valve.

The other elements of water-gas plant are of the usual type. It was noticed that the meters commonly employed were those of the drum type of the Rotary Company, of Thomas, and of the Republic Flow-Meter Company, of Chicago.

Coal-Gas Plant.

In passing to consider the plant for the manufacture of coal gas, M. Zollikofer deals with the several works visited—namely, those at Buffalo, Detroit, and New York, all of them provided with horizontal or inclined retorts. It is mentioned that in all the gas-works in the United States only silica bricks, containing 94 to 96 p.ct. of silica, are used. As with so thin a material it is not possible to make retorts in a single piece, the latter are constructed of bricks. It was stated that excellent results had been obtained as regards the life of the retorts and the conductivity of the heat—the method having been chiefly evolved in the coking industry.

At Buffalo, an old bench of horizontal furnaces had been applied to the production of oil gas. A tank of wrought iron was introduced, and oil was admitted to it by a pipe—the oil vapour being then gasified in the incandescent retort. This variety of Pintsch gas was made for railway carriages. There was a similar plant at Detroit.

The horizontal continuous retort-furnaces in the works of the Detroit City Gas Company have retorts 8 m. long, which are charged by the De Brouwer machine. Discharging is done by an implement which pushes the coke to one side. The retorts are of cemented grooved-and-tongued silica bricks.

A special feature of these retorts, which are in sets of four, is the arrangement of the gas outlets. The retorts are connected with a vertical conduit of about 200 mm. diameter, which is taken above to the hydraulic main, and below to a special tar-main. This conduit is sprinkled inside with water. The lower tar-main discharges its overflow by a syphon into a receptacle which is connected with the separating tank, and from which the sprinkling water is drawn when separation has taken place. These two mains extend along the whole battery of the furnace.

In the Astoria works of the Consolidated Gas Company of New York—the largest works in the United States—there is an installation of inclined retorts and one of vertical retorts. The former are on the well-known Didier system. In the case of the horizontal retorts the furnaces (each for ten retorts) are arranged continuously in two parallel benches. The producers are placed on the two faces of the furnaces. The discharging plant is constructed so that the furnaces may be discharged from either end of the retort, and the producers charged at the same time with incandescent coke. Charging and discharging are done by a West machine, the shovel of which can enter an 8-m. retort to the mid-way point. A tar-main is installed on the whole length of the furnace and on each side of the latter—half the number of ascension pipes delivering into each main.

Condensers and washers presented no points of novelty. The exhausters were seldom seen to be of the three-blade pattern, but were generally of the rotary type.

The purifying plant was found to present some novel features. Although the climate of America is at least as severe as that of Switzerland, it was common to find the purifier boxes in the open, as in England. But the boxes invariably had a dry seal for the covers, so that danger from frost is provided against. In the plant at Detroit, the cover is sealed by means of well-greased manhole packing, placed between the cover and the box. These boxes were six in number, of about 9 m. by 7 m. and about 4 m. in depth.

The boxes are charged with an artificial purifying material in two layers of about 2 m. deep, through which the gas travels from the middle of the material. The purifying material is prepared on the works by mixing cast-iron filings with shavings. About 350 kilos. of the filings are used per cb.m. of the shavings. The latter are thoroughly wetted with water, and the iron then rapidly oxidizes, with development of heat—the mass being turned over about six times with the shovel.

Owing to its low specific gravity, the material calls for boxes of very large size. As a rule, the latter are built on girders, so that they can be emptied from beneath. The fresh material, together with that which has been revivified, is generally raised by mechanical conveyors—as, for example, in the water-gas works at Buffalo, where skips are taken up by elevators, and the material delivered on to boards, from which it is pushed into the purifiers. An excellent plant of this kind was seen at Detroit. The material is raised by a bucket conveyor attached to the gear serving for the raising of the covers. This conveyor brings the material to a horizontal endless screw, fixed on the rolling bridge, and allowing of its charge being delivered to any part of the boxes by means of the opening in the shoot above the boxes.

The conduit system installed with each set of purifiers presented no novel features. There were, in fact, cases in which it was not possible to have all the purifiers in use at once.

At the Astoria works a very neat arrangement is adopted for the connection of the works' mains to the works' meters. The outlet of the meter is arranged in its upper part, so that the space occupied by this system of conduits is greatly reduced.

The arrangements for storing the coal, and for transporting it from store, differ considerably from those in large Swiss works. As a rule, coal is stored in the open, but sometimes in hangars. As American wagons are all constructed to empty from the bottom, there is no need for tipping-gear. The contents of the wagon are discharged into an excavation; and the coal is then carried by conveyors or skips to the furnaces or temporary store. It is moved from this latter by means of skips of dredger (jaw) pattern, the capacity of which is often as much as 5 tonnes. It is then carried by railway wagons to bucket conveyors, by which it is taken to the furnace-bunkers. Apparently large coal bunkers, as used in Europe, are not employed.

It should be mentioned that since the war all works making coal or water gas have been equipped for extracting the light oils contained in the gas; but these washers were no longer in operation. They consisted of cylinders with wooden grids sprinkled with mineral oil. According to the size of the works, the extract was treated on the spot or elsewhere.

Coke-Oven Gas.

As regards coke-oven gas, in the United States 44 p.ct. of the production of coke is from furnaces working with recovery of bye-products; the balance (representing the greater proportion) is still made in the old beehive furnaces, in which the gas and bye-products are lost. Such waste of fuel is possible only in a country like America, where coal is obtained very cheaply and in great abundance. At the present day, however, the recovery of the bye-products is undergoing astonishingly rapid development, and the beehive oven is being replaced by modern plant. Coking is part of the gas industry in the United States, since a number of companies possess coking furnaces or buy coke gas for supply to urban districts. There is no doubt that coking furnaces are most suitable to American conditions; and it seems that development will go forward on the lines of substituting the old pattern of furnace by horizontal and inclined retorts and chambers of large size.

The first coking plant visited was that of the M'Kinney Steel Company, of Cleveland, consisting of four batteries of 51 furnaces each, making altogether a single line of 204 furnaces. This fine installation was constructed by the Pittsburg firm of Koppers, and compelled admiration for its splendid design. It was started working in 1916. The furnaces are supplied with four kinds of coal, about half of which is a rich coal of 30 p.ct. volatile matter, and the other half a lean coal containing about 18 p.ct. of volatile matter. The coke produced is somewhat soft, and the pieces not very large. The coal, on being discharged into an excavation from the bottoms of the railway wagons, is delivered to the furnace bunkers by hand conveyors. During its travel particles of iron which it may contain are removed by means of magnets. A wagon fitted with four delivery shoots traverses the bench of furnaces, charging the chambers. There is also an equalizing machine connected to the discharger, which smooths the surfaces of the coal in the hoppers. The distillation chambers, of silica bricks, are heated by coke-gas furnaces arranged with vertical passages. The pre-heating of the air is done by a regenerative system.

The chambers of these furnaces hold 12·5 tonnes of coal, which distills in 16 hours. The yield of gas is about 30 cb.m. per 100 kilos. of coal; and that of coke about 70 p.ct. The width of the chamber is 46 c.m.; the length, 13·5 m.; and the height, 3 m. Of the gas produced, 45 p.ct. is used for heating the furnaces. The balance is available for raising steam, and for use in Siemens-Martin furnaces. Part of it is also sold to the East Ohio Gas Company, who re-sell the coke gas for industrial purposes, and for supplementing their supply of natural gas.

The daily consumption of coal is 3285 tonnes; 1,150,000 cb.m. of gas, and 2700 tonnes of coke being produced. Of the latter, 2000 tonnes per day are delivered to four blast-furnaces, each having a production of 500 tonnes of pig-iron, while the remainder is sold for industrial or domestic heating.

The Koppers process for the direct production of sulphate is in use here. In order to bring-about the reaction in the saturating vat at a favourable temperature—that is to say, with the gas at 75° C.—the gas is previously cooled to 30° C., and then introduced into a cooling chamber for exchange of heat with the hot crude gas, or it is brought afresh to the required temperature by a special pre-heating chamber. The ammonia contained in the condensates in the cooler is distilled and likewise passes into the saturating vat.

The enormous quantity of gas produced by the plant is drawn off by a single turbo-extractor of the General Electric Company, provided with regulating gear extremely sensitive to variations in pressure.

Another coking plant which was visited was that of the Laclede Gas Company, St. Louis—the finest and most modern installation inspected, which has been working since 1915. The chambers hold 13·5 tonnes of coal, distilled in 17 hrs. 40 mins. The consumption of Elkhorn coal is 1000 tonnes per day, yielding 700 tonnes of coke and 300,000 cb.m. of gas, half of which is used for the heating of the furnaces and the remainder for the town supply.

While in the M'Kinney plant there is only one hydraulic main, there are two here, erected on the furnaces and traversing their length. One of them receives the best gas, intended for the town supply, and the other gas of a poorer quality which comes off towards the end of the charge and is used for furnace heating after the extraction of the benzol. A point of novelty is the arrangement of the rotating extractors. For economy of space, these machines are placed obliquely in the building.

The benzol washers—consisting of large cylinders with wooden grids sprinkled with mineral oil—are placed in the open. Gas for the town supply is given a calorific power of 5500 calories per cb.m., while that for the furnace is about 4200 calories.

The benzol extraction works is also the construction of the firm of Koppers. The light oils are separated from the washing oils by continuous distillation. Next very exact separation of benzol, toluol, and intermediate fractions is done by double distillation in two large columns, after which the liquids are again washed in special plant with soda lye and with sulphuric acid. It is found that 1800 gallons of crude benzol will yield 300 gallons of toluol, 1300 gallons of benzol, and 200 gallons of solvent naphtha.

The arrangements for the preparation and the conveyance of the coke present two interesting details. In the first place the Koppers disc grader is a sorting apparatus of extraordinary capacity, and much superior for large makes to other systems of sifting. With this machine, up to 100 tonnes of coke is screened per hour, yielding a product free from dust and of from 60 to 70 mm. grade. The other arrangement is a machine for loading covered wagons which can be used for goods of all kinds—such as coke, coal, &c.

The Laclede Gas Company are very satisfied with their coking plant, which has enabled them to establish a profitable business in coke. The Company pay 33 frs. per tonne free at the works for the best Elkhorn Kentucky coals. They can sell the big coke to the foundries or blast-furnaces at 55 frs. per tonne, and small coke for domestic use at 44 frs. The coke delivered to the house of the purchaser represents a price of 60 to 65 frs., so that the difference between the prices of coal and coke is such as to allow the gas being regarded as a minor product.

DISTRIBUTION OF GAS.

The conditions in the distribution of gas in the United States represent, however, the greatest departure from European systems. In most American towns the gas is distributed in the first place by a system of mains at a pressure of from 1400 to 3600 mm. The gas is compressed by a Roots or a Connersville machine operated by steam-engine or gas-motor. Piston compressors are rarely used—only for the higher pressures. The low-pressure system, connected to that at high pressure, is supplied from this latter by a series of governors in parallel, and at a pressure of 100 mm. at the outlet of the regulator. This method is, of course, only used in level districts.

The town of Chicago has altogether 75 of these regulators. The suburbs are supplied by independent high-pressure mains in which the pressure is increased according to the distances traversed. The regulators are contained in chambers placed under the roadway or pavements. They are membrane appliances, the use of which is widespread in the handling of natural gas. The construction is identical with that of those used in Europe, except that the bye-pass often consists of a single wrought-iron pipe with a cock which, in case of the regulator becoming deranged, supplies a sufficient quantity of gas to the low-pressure system. Apart from this, a number of large valves are arranged between the two systems, permitting of supply to the low-pressure mains at the gasholder pressure, and devised against the possibility of the high-pressure failing from any cause.

In New York the system of distribution is different; the whole town being supplied at low pressure directly from the gasholders. This arises from the fact that formerly the town was supplied by five gas companies, each having a system of mains of sufficient size. On the amalgamation of these companies, the five systems were joined-up, and thus the conditions are favourable to the new combined system—particularly as the former works, or at any rate their gasholders, have been retained. In the northern part of the town compressed gas is supplied, partly from works in New York and partly from others suitably situated. The street mains used are of cast iron with ordinary box joints, caulked with hemp and lead. There are some works which prefer the taper or swallow-tail junctions, as making a better joint. Lead wool is widely used.

In St. Louis it was stated that many of the joints are cast in cement and had yielded satisfactory results. This kind of joint provides a measure of protection of the mains from any stray currents with which American engineers appear to be troubled more than those in Europe.

The boxes are caulked with hemp of good quality on half of their depth, and the space is then filled with a plastic mortar consisting of three parts of cement and one of sand. In places where the ground does not afford the best foundation, wrought-iron mains are frequently used for high pressure.

In carrying the mains across bridges, the European practice is not followed of laying the main in the superstructure of the bridge. Little regard is paid to appearance, and the mains are usually fixed above the superstructure or in the trellis work of the girders.

Inasmuch as it is American practice to lay underground mains only a short way below the surface, difficulties are sometimes experienced in crossing them. In some cases these are avoided by using mains of rectangular section formed of soldered wrought-iron plates.

NATURAL GAS SUPPLY.

The use and supply of natural gas is of such importance in the United States that a review of the whole industry cannot be considered complete in the absence of particulars of the main features of this source of light and power. The source of natural gas is undoubtedly the same as that of petroleum. Gas and petroleum beds occur in the same regions. Financially, the petroleum industry and that of natural gas are in the same hands, although the connection is not officially admitted. One of the chief undertakings connected with natural gas is the East Ohio Gas Company, by the courtesy of which the Swiss delegates were able to make their observations of the technical methods employed.

The chief constituent of natural gas is methane, frequently present to the extent of 99 p.ct. The calorific power of the gas varies between 9000 and 9800 calories per cb.m., or approximately double that of coal gas. Its price averages 7 c. per cb.m.; whereas in districts supplied with natural gas the cost of coal or water gas is 15 c. to 28 c. per cb.m. For this reason, in the districts proper of natural gas a gas-works cannot exist; and hence a gas from coal or water is manufactured also by the natural gas companies for the purpose of supplying consumers who use it constantly. For the natural gas industry is subject to great fluctuations. It may happen that the borings carried out at great cost suddenly give-out or that the yields over a whole district become prematurely reduced. In 1911 28,400 sources of natural gas were being exploited, with a total production of 9500 million cb.m. of gas for industrial use and 4500 million cb.m. for domestic purposes—a total of 14,000 million cb.m. In 1916 the total consumption had risen to 21 milliards cb.m. In the use of natural gas, all those applications familiar in the case of coal gas come within its province; and further, owing to its low price, it is employed as a fuel in metallurgical operations. In a steel-works at Cleveland, for example, 28,000 cb.m. of natural gas are used per day for the heating of Siemens-Martin furnaces.

The natural gas companies obtain the gas from purchased or leased districts by sinking wells—viz., borings which frequently are as deep as 2000 m. The gas accumulates in the rock at a pressure which may exceed 70 atmospheres. It is collected by steel tubes, and conducted thence at a high pressure by wrought-iron conduits.

Generally speaking, the design of the distribution system is as follows: Mains convey the gas from the different sources in a district (the yield from each source being measured) to a collecting main. The gas is then compressed with plant which in some cases requires to be of 30,000 H.P., and is then passed forward at a standard pressure of 21 atmospheres. These compressing works are required in order to obtain the maximum yield during the winter season. Also the various sources vary greatly in pressure. Those which are approaching exhaustion frequently do not have sufficient pressure for driving the gas for any great distance.

From the compressing stations the gas traverses so-called district mains which bring it into the various distribution sectors. In this way, the town of Cleveland gets its gas from Hastings, in West Virginia, a distance of 640 kilos.

The district mains are connected at these stations with regulators and meters which usually are several miles from the zones of consumption. Loss of pressure from friction brings the gas to a pressure of 6 or 7 atmospheres, which is further reduced to 3·5 atmospheres by high-pressure regulators. The gas is afterwards measured by register flow-meters, the planimetric diagrams of which indicate the quantity passed.

From these measuring stations the gas passes to the high-pressure distribution system, and from it to the low-pressure system, from which the consumers draw their supply.

In consequence of the fluctuations of flow at the sources, it is necessary to exercise control over consumption. The quantity of available gas may be appreciably increased by putting all the compressing stations into operation, and successively cutting-out the supply of gas to industrial establishments, which can employ oil for heating during the period of suspension. But in times of great cold, all these measures may prove insufficient, in which event the company announce in the press that an inadequate supply is imminent, and that distribution cannot be guaranteed unless economy is observed by the consumer. For these reasons, furnaces, &c., are constructed capable of working either with gas or solid fuel. In the case of the East Ohio Gas Company, this shortage is experienced each winter for about 21 days. The Company compile elaborate statistics, based on previous records, for the purpose of ascertaining at what temperature the shortage of gas will occur. The Company supply some 300,000 consumers, 200,000 of whom are in Cleveland, and distribute a maximum of 7 million cb m. per day.

It is calculated that for heating alone each degree Centigrade below 0° occasions an excess of consumption over supply to the amount of 0·54 cb.m. per consumer; so that at an atmospheric temperature of — 20° C. the extra gas required is 3 million cb.m. per day. These are conditions with which it is difficult to cope. The Company are proposing to provide against this temporary shortage by enlarging their plant for water gas by using more coke-oven gas, and by constructing gasholders. A highly developed centralized system of keeping track of production is concentrated in a single office, which receives telegraphic and telephonic data from the gas-fields, and thus allows of controlling distribution in accordance with the communicated pressures and yields.

Of late years much attention has been paid to the extraction of hydrocarbons of the fatty series—pentane, hexane, &c., from natural gas. By washing with heavy oils and by distillation of the extract, gasoline (petrol) of very great value is also obtained. This latter process yielded, in 1916, 415 million litres of gasoline—an enormous quantity, yet only 5 p.ct. of the total gasoline production of the United States.

For the high-pressure conduits of natural gas only steel is used; the mains being flexibly connected by means of jointed rubber sleeves. Protection against stray currents is carried out, in places where it is required, by insulating the whole main in a rubber sleeve, which further serves to ensure staunchness of the joints.

NATIONAL SAFETY COUNCIL.

In conclusion, M. Zollikofer very briefly reviews the measures taken in the United States for the prevention of accidents, as embodied in the widespread and multifarious activities of the National Safety Council. The work of this body has been much developed in consequence of the fact that precautions against accidents are not the subject of statutes applying to the whole of the United States, but are regulated by the legislature and police of individual States in conformity with the American Constitution. For example, there is no United States statute against the employment of children in industry; but attempts have been made to lay an embargo on this practice by seeking to introduce a statute prohibiting the sale in other States of goods made in factories employing children of less age than 15 years. Since the statistical work of the Chambers of Commerce is done with great minuteness, a measure of this kind would be equivalent to prohibiting child labour. On this account, the proposed measure has been held to be unconstitutional; but a Bill is in preparation, and stands a chance of becoming law, which imposes a special tax on concerns employing children. The example is cited as an instance of the jealousy with which the rights of individual States are ever guarded, even in cases where the necessity of general legislation is admitted.

The regulations of the individual States are administered by

inspectors. This control, however, extends only to manufacture, and to the establishment of protective measures against accidents and insanitary conditions. Nevertheless, the number of accidents in the course of a year reaches the high figure of 70,000; and as statistics show that the greater number are due not to lack of protective measures but to carelessness on the part of work people, the occasion has been provided for a great propagandist movement, the slogan of which is "Safety First." This work is carried on by the National Safety Council established in 1913—not as a Government institution but by the collaboration of the leading industrial concerns.

A large measure of the activities of the Council is applied to a programme of caution by leaflets, posters, and lectures, inculcating the precautions to be taken in various industrial occupations. American industrialists keep before them the fact that not only do they suffer the cost of an accident, which they may cover by insurance, but also the loss which results from a well-trained workman having to be replaced by another whose proficiency will not be reached until after the expiration of some time, during which the particular unit of plant is working at a lower capacity. This policy has, no doubt, been the reason for the great increase among the supporters of the National Safety Council. It was stated that the number of accidents has been greatly reduced in those industrial concerns which the "N.S.C." has taken in hand. In one case a concern which previously expended $45,000 per annum on its insurance was able to reduce this sum to $4500 when applying the "safety service" to the industry.

In works employing more than 1000 hands a superintendent is specially allotted to supervise training against accidents. Also a Safety Committee is formed (consisting as a rule of a manager, chief engineer, and foreman), which meets twice a month and discusses and carries out new measures for the avoidance of accidents, while receiving the report of a workmen's committee. This latter is a body which, it is intended, should be formed separately in each undertaking for investigating and reporting on the prevention of accidents. The workmen's committee is composed as far as possible of men representing the various branches of a factory. The specially appointed superintendent of accidents performs the duties of secretary to these two committees. In undertakings of smaller size, bodies of a similar kind are formed to concern themselves with sanitary conditions, and are in touch with workmen by whom they are advised or informed. The National Safety Council itself is divided into twelve departments, representing as many groups of industry. It is perfectly plain that it plays a very important part in the United States, apart from legal regulations, in the prevention of accidents.

DETERMINATION OF TAR ACIDS IN THE DRAINAGE FROM TARRED ROADS.

In a communication to the Aug. 16 issue of the "Journal of the Society of Chemical Industry," Dr. J. J. Fox and Mr. A. J. H. Gauge, writing from the Government Laboratory, on July 24, say: As a result of experiments carried out by Mr. A. J. Mason-Jones, the Biologist to the Joint Fisheries Committee (Tar Pollution) of the Ministries of Transport and Agriculture, it is now known that water which has been polluted by tar, and in which the amount of tar acids is as little as 1 part per 100,000 is fatal to fish-life. It is, therefore, important to possess a ready means of detecting and estimating such minute quantities of tar acids. The method described in this note depends upon the formation of the azo-dyes obtained when sulphanilic acid is diazotized and poured into water containing tar-acids after it has been rendered alkaline. The depth of colour produced is matched in a Nessler tube by the colour obtained under similar conditions with a mixture of the three cresols in the proportions specified below. The tar-acids in the washings from tarred roads will not as a rule include much phenol, but consist of cresols and higher phenols. The mixture of cresols used by us has been found to be generally available as regards shade of dye produced; but occasionally the matching becomes a little troublesome on account of the red shade produced by the higher phenols.

The solutions required are: (1) recrystallized colourless sulphanilic acid, 1·91 g. in 250 c.c. water, (2) pure sodium nitrate, 0·85 g. in 250 c.c., (3) sulphuric acid, one part of strong acid (sp. gr. 1·84) to three parts of water, (4) 8 p.ct. sodium hydroxide solution, (5) standard cresol solution containing 1 gr. mixed cresols per litre. The mixture of cresols for (5) consists of 35 p.ct. *o*-cresol, 40 p.ct. *m*-cresol, and 25 p.ct. *p*-cresol.

The diazotized sulphanilic acid solution is prepared about five minutes before use, by mixing five volumes of sulphanilic acid solution with one volume of the sulphuric acid, adding five volumes of sodium nitrate solution, and cooling in a stream of cold water.

The cresol solution used for comparing the colour is a dilute solution prepared by mixing 5 c.c. of the strong solution (5) with 95 c.c. of distilled water—*i.e.*, 1 c.c. of the dilute solution = 0·00005 g. of cresol. Weak solutions of cresols are liable to change; and the standard dilute solution should, therefore, be prepared just before use. The strong solution (5) is stable if kept in a cool, dark place.

To make the test, 100 c.c. (or less of a strong tar extract) of the clear water or washings is placed in a Nessler cylinder and 5 c.c. of the sodium hydroxide solution added, followed by 10 c.c. of the diazotized sulphanilic acid. On stirring, an orange-coloured dye is formed when tar acids are present. The depth of colour is matched by adding to a similar quantity of distilled water in a second Nessler cylinder 2 c.c. of the dilute standard cresol solution, 5 c.c. of sodium hydroxide solution, and 10 c.c. of the diazotized sulphanilic acid solution. This is the trial assay, and determines the amount of cresol solution to be used to obtain an exact matching of the depth of colour due to tar acids in the water under test. The best results are obtained when 1 to 2 c.c. of the diluted standard cresol solution is required to obtain equal depths of colour. This can be secured as usual in this class of work by taking smaller or larger quantities of the sample under examination. The amount of tar acid is calculated from the quantity of cresol solution required to produce equal tints.

When the washings are coloured, or opalescent, the tar acids can be obtained by steam distillation—taking 250 to 500 c.c. of the water and testing successive portions of the distillate. This procedure is also advantageous when traces of tar acids are suspected, as it affords a means of concentration.

We have found that very dilute solutions of various tar products—*e.g.*, certain tar acids and tar bases and naphthalene—in non-sterile water rapidly undergo biological change. For this reason the examination of samples of water for tar acids must be carried out at the earliest possible moment after collection. A delay of 48 hours may result in the oxidation of a considerable proportion of the tar acids.

From Mr. Mason-Jones's results, the presence of more than one part of tar acids per 100,000 in effluents or road washings must be regarded with suspicion where fish-life is concerned.

The test for tar acids outlined above is very delicate—much less than one part per million being detectable. By this means phenols in minute quantities have been found to be very widely distributed. A fuller account of this will be given on a future occasion, together with a statement of the alteration undergone by dilute solutions of phenols and tar bases under the action of bacteria.

Oil Prices and Gas Rates.

At Trenton (N.J.) the Board of Public Utility Commissioners have refused the application of the Public Service Gas Company to be permitted to increase or decrease the basic charge for gas, in accordance with the fluctuations of the oil market. The Company pointed to the growing scarcity and consequent mounting cost of gas oil, and to the fact that on the expiry of their current contract they would have to purchase oil in the open market at varying prices above that existing when the present charge for gas was fixed. The reply of the Board was to the effect that the uncertainty both as to the supply and price of gas oil was too well known to require discussion; nor did the probable causes need consideration. Oil was one of the large factors in the manufacture of gas; and the result of adopting the Company's proposal would be a fluctuating price of gas. In theory, such a method would appear to be sound. The resulting uncertainty to the consumer as to the price to be charged would, however, make it impracticable, and probably cause much confusion and annoyance. The Board have, in fact, found that general dissatisfaction arises from the application of variable rates. The Board admit having approved of the application of coal clauses to the rates for wholesale electric power, but say that in such cases this affects manufacturers who obtain power from electric companies. If these manufacturers maintained their own electric plants, the cost to them of current would vary with changes in the price of coal. To allow a fluctuating price of current to customers in general of electricity, corresponding with changes in the price of coal, would be subject to the same objections as apply in the case of gas. Taking everything into account, they think it is desirable that, when a rate is fixed, it should remain in effect independent of temporary fluctuations in operating costs.

Ammonium Nitrate and Low-Temperature Distillation.—There recently appeared in the "Zeitschrift für Dampfkessel und Maschinenbetrieb" an article the object of which is to show that, as a result of "primary coking," or low-temperature distillation, very little nitrogen in the form of ammonia may be recovered. Abstracting the article, the "Technical Review" says: According to Christie, during the tar period (300° to 500°) only 2·5 p.ct. of the total nitrogen will be given-off as ammonia, as against 13 to 15 p.ct. in a gas-producer. Figures are quoted, from the results of experiments by Knoblauch, M'Leod, and Short, to show how, in coal-gas manufacture and coke-ovens, from 12 to 17 p.ct. of the total nitrogen content of the coal is obtained as ammonia. The results of experiments with the revolving drum apparatus at the Mühlheim Institute are then given, to show that from "primary coking" only 1·8 p.ct. of the total nitrogen is obtained in the ammonia recovered. The author draws the conclusion that "primary coking," if conducted for its own sake in revolving drum apparatus must renounce all claims to the production of considerable quantities of ammonia, unless after the completion of the actual coking, and the elimination of the tar, the remaining coke is still further heated to recover the ammonia contained in it. The use of steam during the process does not influence the quantity of ammonia recovered.

CHEMICAL NOTES AND EXPERIENCES IN GAS MANUFACTURE.

By WALTER H. BATTERSBY, of Bury.

[A Paper to be read before the Manchester and District Junior Gas Association, at Horwich, on Wednesday, Sept. 1.]

COAL.

Coal, in the general sense of the word, has completely changed during the last few years. In former days, even in winter, the gas engineer could look over his well-filled coal-store with a feeling of contentment; but now his stocks are often depleted to within one or two days' supply. In pre-war days the inerts of the coal would average about 7 p.ct. At present, 20 to 25 p.ct. of incombustibles is not uncommon; and these have to be paid for in many ways—consequently handicapping the industry to a very high degree. Not only does the unsuitable coal supplied reduce the amount of gas and bye-products capable of being extracted; but extra labour is entailed in handling an initial amount of material, and also in clinkering and pricking-out producer fires. With the present high prices for cartage, the final removal of the inerts is a considerable item. For example, a works carbonizing 30,000 tons of coal and using 3600 tons of coke (containing 30 p.ct. of ash) for heating the retorts will have to pay for the removal of over 1000 tons of ashes.

TESTING OF COAL.

Before attempting to carbonize any unfamiliar coal, we first of all have samples taken and tests carried out for moisture, volatile matter, and ash content. This information is quickly obtained, and is a fairly reliable indication of the behaviour of the coal in the retorts, and particularly the coke made therefrom in the producers. During the last few years, we have at times been carbonizing sixteen different coals, or, more correctly, "slacks." Here the analysis has been of great help in giving first-hand knowledge and information of each particular coal; and this, associated with judicious mixing, has enabled us to obtain far better results than would have been possible with haphazard working. I can also recommend the practice of having daily samples of coal collected from the retort-house conveyor belt. At this point, the coal having passed the breakers, a good average sample is easily obtained. This should be immediately stored in an air-tight vessel until required. Samples taken in the manner described and if only tested for moisture, ash, and volatile matter, give information which forms a valuable record of the quality of the raw material upon which the manufacturing results should be based.

In the testing of the coal previously mentioned, the sample must first of all be finely powdered, and the amount of moisture present estimated by drying in a steam-oven at the standard temperature of 105° C. In the estimation of ash and volatile matter, some workers carry out the tests on the undried sample; but as this may lead to inaccuracies, due to loss by spiriting, it is preferable to carry out the estimations on the dried samples. For the estimation of ash, the apparatus I have found to give satisfactory results, while at the same time embracing simplicity, low cost, and long life, consists of a silica tube 12 in. long by ½ in. diameter, conveniently supported and heated by a distributed bunsen flame consuming gas at 6 in. pressure. The coal is contained in a porcelain boat, and half a gram consumed in the experiment. The aspirator generally prescribed in text-books I have now discarded; all the air necessary for combustion being induced by inclining the combustion tube at an angle of 10°. The estimation of volatile matter may be conveniently carried out by the method devised by the American Bureau of Standards, in which a platinum crucible and a standard heating flame are used. I am of opinion that the electrical furnace will be ultimately adopted as the heating medium for volatile matter estimation, as by this method a constant and standard temperature is easily attained. In this connection, I am at present carrying out a number of experiments on the Lessing electrical furnace supplied by Messrs. Gallenkamp, of London. In this apparatus 1000° C. is readily obtained; and it is perfectly controlled by means of an electrical resistance.

COKE.

In estimating the amount of ash in coke, the apparatus used for testing coal is employed; but if the test is to be done in a reasonable amount of time, the combustion should be carried out in a stream of oxygen. When comparing the ash content of different cokes, it should be borne in mind that not only is the amount important, but that the composition of the ash also plays a great part in the behaviour of the fuel when consumed in a producer or other type of furnace. Here an ash composed chiefly of metallic oxide will give infinitely more trouble than one of a sandy nature. Of course, a chemical analysis will reveal the exact composition, and in certain cases this may be necessary; but, as a rule, to an experienced worker the composition will be indicated by the physical characteristics of the ash.

We have found coke extracted from the producer ash-pans to possess a comparatively high ignition point, and to be much inferior to ordinary yard coke when used under steam-boilers, although these are fitted with an efficient forced draught. On first thoughts we were inclined to attribute these properties solely to the high moisture content; but on investigation we discovered that this coke contained a comparatively small amount of volatile matter—over 50 p.ct. having been extracted by the passage of the coke through the producer furnace. This is fully illustrated by the following tests:

Coke direct from retorts	1·8 p.ct. volatile matter
Pan ash coke	0·8 ,, ,, ,,
Reduction	1·0 p.ct., or 55 p.ct. on total.

Of course, this coke can be easily utilized by previously mixing with yard coke.

While on the question of the volatility of coke, it is interesting to recall the recent results obtained by the Institution of Gas Engineers' Research Committee on the steaming of vertical retorts at Uddingston. The report states that the results obtained do not lend any support to the prevalent idea that the sweeping action of steam is conducive to a much more complete removal of the volatile matter from the coke, but rather that the volatile content is dependent mainly on the highest temperature to which the coke is subjected inside the retort. From investigations carried out on several installations of verticals, I am led to the opinion that not only does the highest temperature of the retort play an important part in the quality of the coke, but the throughput or time factor also largely enters into the question; for on several installations where steaming is in operation the throughput has been reduced by over 30 p.ct., and in some plants this is being accomplished by stopping the extractor during certain periods of the day. By this method of working, the coke is subjected to prolonged heating which will undoubtedly reduce the volatile matter content. Tests carried out by Dr. Davidson have shown that well burned-off coke containing 1·97 p.ct. of volatile matter will yield on further heating 2900 c.ft. of gas per ton of coke, the composition of the gas being as follows:

H_2 86·8 p.ct., CH_4 2·05 p.ct., CO 6·5 p.ct., CO_2 0·6 p.ct., N_2 4·05 p.ct.

SPECIFIC GRAVITY AND QUALITY OF GAS.

This is of particular interest to the Distribution Superintendent, as a high density not only interferes with the delivering capacity of the mains and services, but is generally associated with gas of low quality. From actual tests, I have found gas with a heating value of 490 gross made from horizontals to contain 28 p.ct. of inerts, and possess a specific gravity of ·58. In connection with the quality of the gas sent out, I have found that the atmospheric conditions have a very marked effect on the behaviour of the gas in the district. In our own case during the winter months, if satisfaction is to be given with the absence of back-firing, the gas distributed must possess a heating value at least 15 B.Th.U. higher than the summer average.

A PURIFICATION EXPERIENCE.

A rather interesting oxide purification experience recently occupied my attention, and occurred in connection with an installation of four purifiers each measuring 33 ft. by 22 ft., and fitted with a Weck centre-valve and luteless lids. These boxes had originally been installed for lime purification; and to reduce back-pressure the inlet connections were arranged so that the gas entered half-way up the box and then divided into two streams—one passing upwards and the other downwards through equal thicknesses of material. As this system of working had given satisfaction with lime, we made no alteration on changing-over to oxide. The boxes were charged with two 1-ft. layers of artificial oxide containing 30 p.ct. of moisture, and were put to work on the backward rotation system of purification. We soon found, however, that revivification was not taking place to any extent; and although the boxes were only dealing with a comparatively small quantity of gas, the oxide was taking up very little sulphuretted hydrogen, and quickly became foul. At this stage we had the boxes emptied, and the oxide tested for sulphur; the following average results being obtained:

—	Moisture.	Sulphur Wet.	Sulphur Dry.
Top layer	24·6	3·0	3·9
Bottom layer	19·2	20·6	25·4

These figures show very clearly that only the bottom layer of oxide had been carrying on purification to any degree. Although on first thoughts the comparatively large amount of sulphur in the bottom layer might be taken as a direct testimonial to the efficiency of downward flow, I am inclined to think that the majority of the gas had travelled in this direction, and the top layer bye-passed to a very large extent. As this behaviour is not to be desired, we are converting this set of purifiers to a system of downward flow.

TAR AND AMMONIUM CHLORIDE.

Ammonium chloride is generally heard of in connection with the deposits of tar from the hydraulic mains of vertical retorts; so I think an experience with this compound and tar from horizontal retorts will not be out of place. I must first of all remind you that we have our own tar-distillation works at Bury; and it was in this plant the ammonium chloride made itself known by suddenly and without warning completely blocking a 4-in. cast-iron condensing worm connected to a 16-ton tar-still. The trouble at this point was overcome by introducing an auxiliary supply of steam into the worm and carrying out distillation very slowly.

We, however, immediately saw that the only satisfactory solution was to prevent the tar taking up ammonium chloride during the process of gas manufacture. Shortly before the chloride appeared we had commenced gas-making on a bench of retorts fitted with the patent anti-dip valve invented by my chief (Mr. H. Simmonds, F.C.S.), and the foul-main connections were arranged so that the gas, tar, and liquor travelled together from the hydraulic main to the inlet of the condensers. A little consideration showed us that this arrangement allowed prolonged contact of the heavy tar and virgin liquor, and afforded ample opportunity for the tar to absorb the fixed salts of which the virgin liquor is chiefly composed. Our next step was to introduce into the hydraulic mains a small continuous stream of 3½° to 4° Twaddel well liquor, with the object of diluting the virgin liquor, and at the same time washing the chloride from the tar during its travel through the foul main. This method of working proved a complete success, for immediately after its introduction the deposits of chloride entirely disappeared from the tar-still condenser, and the condition of the top and side plates of the still when periodically examined warrant me stating that the tar is practically free from ammonium chloride. This experience shows very clearly that, under certain conditions, tar has a great attraction for ammonium chloride; and as the exercise of this property can only result in a reduction of the ammonia returns, I certainly think that it would pay many works to have their tar examined for its total ammonia compounds.

Oil Atomization, Naphthalene, and Meters.

Many of you will remember the paper on "Naphthalene and Oil Atomization" read by Mr. Simmonds before the Manchester District Institution of Gas Engineers; so that it is not my intention to enter into details of the apparatus, but rather to give a few particulars of the results we have secured by a continued use of the process. One benefit (unlooked-for at the time the process was started) has been the effect the oil has had on the dry meter diaphragms. Despite the fact that for some considerable time we were benzol extracting, the leathers are found to be in an excellent condition whenever a meter is opened for inspection. This we attribute to oil-spraying at the outlet of the station governor. Naphthalene complaints have very nearly reached the vanishing point. The total number of complaints for the year ended Dec. 31, 1919, was 450, and for the first six months of the current year, 25, or about one per week. These results are with gas made from horizontal retorts, high heats, and 8-hour charges.

SPONTANEOUS COMBUSTION OF COAL.

Included in Vol. 36 of the "Proceedings" of the South Wales Institute of Engineers is a paper of great length which was submitted at a meeting last June by Mr. F. V. Tideswell, M.Sc., on the "Constitution of Coal in Relation to its Spontaneous Combustion," in which, after dealing fully with the historical aspect of the subject, he considers the effects of bacterial activity, the influence of moisture, and pyrites as factors in the spontaneous combustion of coal.

Setting forth what is known with regard to the first point, the author says it must, on the whole, be concluded that, though there is strong evidence that coal is a favourable medium for the growth and life of bacteria, and that bacteria suitably grown in the presence of coal exert an influence on its decomposition and oxidation, there is as yet little evidence either for or against the suggestion that spontaneous combustion is influenced appreciably by bacterial activity.

As to moisture, an opinion very generally held among those engaged practically with the spontaneous combustion of coal is that it exerts a marked accelerating influence. Comparing their results with those of previous workers, Messrs. Katz and Porter concluded that the rates of oxidation of different coals are not affected uniformly by moisture, and said it seemed doubtful whether water, other than the excess which actually wets the coal, plays an important part in the rate at which coal oxidizes at the lower temperatures, with consequent increase in the danger of spontaneous combustion. This view, declares Mr. Tideswell, must be taken as the only one warranted by the evidence at our disposal. When water is present in excess among the coal, different considerations arise. The wetting of the coal will reduce the proportion of open spaces in the mass—especially if the coal is finely divided—with the result of obstructing the flow of air through the pile, thus reducing ventilation and heat dissipation, but also the amount of oxidation. The water taken up in the coal substance itself will also reduce the initial rapid absorption of oxygen. Which effect will predominate depends upon the conditions obtaining. A further effect is the cooling action of the water, which, by its large latent heat of evaporation, hinders the coal from rising above a certain temperature. In a large heap, however, this cooling effect is lost, as the water condenses in other parts of the heap, with a resulting rise of temperature there. On the whole the wetting of coal, as a preventive of spontaneous combustion, seems to be a somewhat doubtful expedient, unless carried out very thoroughly.

The author indicates the trend of the researches on the subject of pyrites as a factor in the spontaneous combustion of coal, and remarks that consideration of the points revealed leads to the conclusion that it would be almost as great an error to ignore completely the presence of pyrites in coal as it was to impute to it full responsibility for spontaneous combustion. Oxidation of the coal substance and oxidation of pyrites work together for the ultimate firing of the coal. In general, the former is by far the major factor; the relative values of the two actions being conditioned, on the one hand, by the chemical activity of the coal towards oxygen and its physical condition, and, on the other hand, by the state of occurrence of the pyrites. A local concentration of an active form of pyrites may be more dangerous than the same distributed uniformly through the coal.

With reference to the constitution of coal in relation to its liability to spontaneous combustion, Mr. Tideswell says it has long been recognized that there is no close connection between the proximate and ultimate analyses of a coal and its liability to ignite in air. Coals of different classes may, however, be differentiated; the ease of ignition decreasing steadily according to the degree of "carbonization" of the coal. Thus the lignites are the most easily oxidizable. Then follow the various grades of bituminous coals, the steam coals, and the anthracites. He reviews the researches made on the relationship between the chemical constituents and the ease of oxidation of a coal, and says that, considering them as a whole, the general consensus of opinion among investigators is to place the onus for the spontaneous combustion of coal mainly, though not exclusively, on those parts of the coal substance which may be regarded as being derived from the cellulosic portions of the original coal-forming materials. The recent studies in the mechanism of the combustion of coal approach the question of the coal compounds responsible for spontaneous combustion from a different view-point. The very great similarity found between the processes of oxidation and carbon points to the constituents which cause the absorption of oxygen—not necessarily, or even probably, those compounds which finally become oxidized—as being related in structure to carbon itself. Though all evidence is against the presence of "free carbon" in coal, the presence of compounds of a similar structure, but still containing considerable proportions of oxygen and hydrogen, has been inferred from other considerations of a totally different nature. Such compounds will find their source in the original celluloses and compound celluloses. Thus evidence from this point of view confirms the conclusions drawn from the chemical evidence, which, on the whole, places the responsibility for the spontaneous combustion of coal on those compounds derived from the cellulosic portions of the original coal-forming material.

A Meter Connection Corrector.

The undertaking responsible for the gas supply of Schenectady (N.Y.) have been experimenting the last two years with what they regard as the most practical meter connection arrangement on the market, its object being to enable a gas-fitter to make perfect meter connections. This connection corrector, when it is put on, compels perfect alignment with the meter tube, and uniform length of meter connections. Among the objects of the invention are to prevent strain on meter connections, and to save labour in installation, and cost. The inventor, Mr. A. J. Le Tarte, points out that the maximum strain on meter tubes—providing there is no additional strain of falling or pulling of lines out of place—is just when the meter couplings are tightened. Various devices have already been suggested to obviate strain and damage to meters; but all of them appear to have been constructed to support the meter, or have consisted of a cross-bar rigidly attached to the piping. A careless pipe-fitter, by depending upon these devices to take care of defective connections, is apt to grow even more careless, so that in many cases nothing is gained. The connection corrector is adapted to slip on the inlet or service-pipe and the outlet-pipe preparatory to making connection to a meter. It not only requires proper alignment of piping in order to permit of its engagement with the piping, but when in position will maintain the pipes in proper alignment. It consists of a rigid frame having connected to it two sets of paired ring-guides, which are adapted to engage the gas-piping. The connector is loosely slipped over the pipe, allowing a certain amount of play, in order to permit adjustment of the offset couplings to any slight tilt or incline of the meter screws. By the use of the corrector, the connection is made with the piping and meter in a vertical position, and no strains exist that might cause leaks in the meter. Though the corrector fits slidably on the gas-pipes, it remains locked in position with the meter as long as the meter connections are there. In case of any loosening of the pipe system, the inlet and outlet pipes near the meter will be held rigidly in an iron frame, and damage to the meter connections will be prevented. As the corrector contains no parts requiring attachment to the piping or the meter, it may be used with pipes and meters of different dimensions.

There is to be a visit on Saturday afternoon of the Midland Section of the Coke-Oven Managers' Association to the works at Cadishead, near Manchester, of British Tar Products, Ltd.

Manchester has been selected for this year's meeting of the Institution of Mining Engineers, on Sept. 15, under the presidency of Col. W. C. Blackett, C.B.E. Among the papers promised is one by Messrs. A. E. Beet and A. E. Findley, on the "Better Utilization of Coking Slack."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Thermal Efficiencies of Gas and Electricity.

SIR,—In reply to his letter of the 13th inst. [see "JOURNAL" last week, pp. 344-5], may I be permitted to point out to Sir Dugald Clerk that, whether he is right or I am right, is not a personal but an industrial matter. It is most important that the country should know what the advantage is from a heat, power, and light point of view of gasifying coal on the one hand and electrifying it on the other. Sir Dugald's statement to the effect that I repeat errors; that I am confused in my mind; that I forget a heat balance-sheet is not a money balance-sheet; that I confuse electro-dynamic with thermo-dynamic transformation; that he finds it difficult to follow my mental processes and so on; and, finally, his attempt to introduce an argument on an entirely different subject—do not tend to convey to thinking people that he is so cocksure after all, for in that case he would not find it necessary to use so many tactics and so few arguments to prove his case. For instance, he now says that he knew forty years ago that one B.Th.U. was as good as another, &c., &c. If Sir Dugald Clerk requires satisfaction on further matters, he shall have it, provided he shows that he has an open mind and is prepared to be convinced when he is wrong in an argument. Meanwhile, one subject at a time is enough. If he can establish his case on rational grounds by the production of incontrovertible facts, let him do it. He has so far failed to carry conviction. He considers his side of the case, as he sees it, as the only possible one, and is content with saying, in effect, that every dissentient is an idiot.

This is all by the way. To proceed: Sir Dugald Clerk, to compare gas production with electricity generation, has adopted for gas a similar method to that used by me in 1916; but he forgets that while I compared two similar, he compares two entirely dissimilar, processes. He still argues that because I did it he can do it. I repeat I could well afford to over-estimate the value of the existing process, and did so. He does not, or will not, see how wrong his adoption of my method is for his purpose. In his reply, he does not say much about my diagrams, although they are based on his own. Evidently he does not like them, as they cannot be juggled with quite so easily as words.

The task I have set myself is:

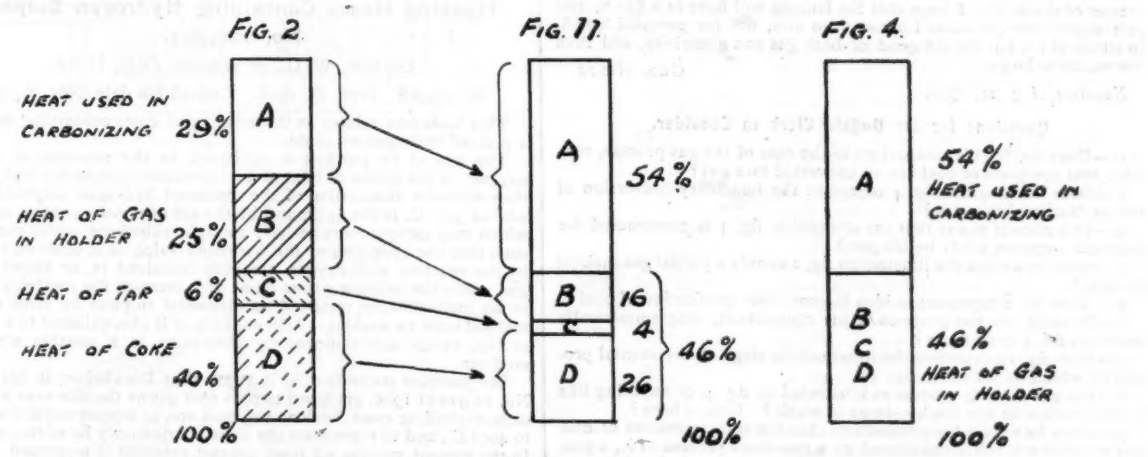
(*a*) To prove that there is no foundation in fact for Sir Dugald Clerk's thermal efficiencies, as given in his joint report, &c.

(*b*) To show that the present process on which Sir Dugald bases his calculations may be resolved into something like fig. 11.

(*c*) To show that a gas-making process, as represented in fig. 11, is an extremely poor process, and its value depends more on coke than on gas.

(*d*) To show the significance of the fact that, to compare gas with electricity, the present partial process in the case of gas making has to be resolved into a complete gasification process.

Let us look at his diagrams again (figs. 2 and 4 shown in my last communication). Here they are reproduced in the company of an intermediate figure.



ACTUAL PROCESS. The partial gasification of 100 parts of coal.

IMAGINARY PROCESS. Representing the intermediate stage of partial gasification of 100 parts of coal, as if such were completely gasified—giving value to tar and coke in fig. 2 as gas. Really an analysis of fig. 4.

IMAGINARY PROCESS. Representing fig. 2, and assuming complete gasification of 100 parts of coal.

In fig. 2 Sir Dugald Clerk represents 100 parts of coal as gasified to-day in ordinary practice, which I accept as such. From this diagram he constructs another "comparison diagram" to his own mind; and not based on any known process, which he argues is its equal (fig. 4). He takes 29 p.ct. and 25 p.ct., and sets down for these percentages 54 and 46. In effect, this is saying: If 29 out of 54 p.ct. is heat loss in the gas process concerned, this is equal to 54 p.ct. out of 100. So fig. 4 takes the place of fig. 2; and he claims for fig. 4 a thermal efficiency of 46 p.ct. as a gas-making process. It may be the thermal efficiency of a gas, coke, and tar process, but not of a gas process. As will be seen even in his imaginary process, gas has to figure as containing only 16 p.ct. of the heat of the original coal.

Fig. 11 shows in greater detail how it may be reasonably supposed the parts of fig. 2 are resolved into fig. 4. Sir Dugald Clerk may not accept this. He will probably find that it will suit him better to stop at fig. 4, and say that 25 p.ct. heat of the coal in gas, 6 p.ct. in tar, and 40 p.ct. in coke are equivalent to 46 p.ct. of gas into the holder, or to the gas-making efficiency of the process. But I do not think he can do otherwise than accept fig. 11; for he must give a value to the coke, the gas, and the tar before he can resolve it into "gas in holder."

Thermally, he says, a gas-making process in which 25 p.ct. of the heat of the original coal is converted into gas and 46 p.ct. of it remains as coke and tar is equal to a gas-making process in which 54 p.ct. of the heat of the original coal is converted into gas and no coke remains. Now when a scientific man sets out to give coke an equivalent value in gas into the holder, it is some job he sets himself. Gas in some uses will do as much work as six times that of solid carbon, such as coal or coke. The average use of coke is given in the "JOURNAL" for April 6, 1920 (p. 13, line 6 of second column) as from 20 to 25 p.ct.; so that B.Th.U. for B.Th.U. coke cannot be compared with gas. The value given as the equivalent of coke is 26 p.ct. if fig. 11 is correct. I will not quibble about this. But what scientific value can a comparison have when such means have to be adopted to construct a figure of comparison such as fig. 4 or 11?

The following paragraph in Sir Dugald's letter is not very helpful in elucidating the matter:

> "It is quite correct to consider the coke and tar as able to evolve 44·2 p.ct. of the original heat of the coal—indeed, practfce in steam-boiler work by Mr. Nicol shows clearly that the efficiency of coke for steam raising is at least equal to that of coal."

Sir Dugald Clerk says that I take no account of the coke and tar left over, amounting to 44 p.ct. of the original heat of the coal, and that such coke is capable of doing just the same work as the same weight of coal. He has no justification, as I have just pointed out in the present comparison, for giving to the coke and tar left over a gas value which he does.

The effect of allowing the full heat value of the bye-products, as in his calculation, is to give the same percentage of heat loss in complete gasification of, roundly, half the original coal (as represented in his comparison, fig. 4) as would apply if the whole of the original coal were gasified—namely, 46 p.ct. My chief objection is that this figure cannot be arrived at by practice, because the practice does not exist As a matter of fact, the gasification of a ton of coal could be carried out to give an immensely better result than 46 p.ct. But this admission does not assist his contention. Because a process could be adopted to give such a result, Sir Dugald Clerk has no right to base the thermal efficiency in so important a matter on what could be done, as if in fact it was done in that manner. Fig. 4 represents at the best nothing but an imaginary process which is in use nowhere. I contend that to state, assume, or calculate that such figure is the equivalent of fig. 2, even for the purpose of arriving at the thermal efficiency of a gas process, is not only ridiculous but unscientific and untrue. The calculation is based on misconception; and, unfortunately, the whole gas industry has been under this and similar misconceptions for a very long time, and suffers accordingly.

Figs. 2, 4, and 11 have only to be examined to realize what the present process of gas making is. Failure to realize facts by our leaders is very largely responsible for the dire position in which the gas industry finds itself to-day. The gas industry having adopted, has continued adopt a process of coke or bye-product making, and calculated the process as being equivalent to a real process of gas making, which it never has been and never will be. When the gas industry as a whole realizes, as some progressive men do, that coke is neither gas nor its equivalent, and sets about more complete gasification of coal, three times the heat energy in the form of gas will be sold for the same money, and shareholders will get their full dividends.

In this connection, it is most significant that Sir Dugald Clerk finds that before he can compare gas production with electricity generation he must translate partial gasification, or bye-product making, into complete gasification. This is what he does; for fig. 4 represents nothing if not a complete gasification process. On his own showing, I say that he can only state the thermal efficiency of the present gas making process as 25 p.ct., and add a rider that at the gas-works are

left 10 cwt. of coke, 10 gallons of tar, &c. This is all he is entitled to claim; or, if he prefers it, that gas undertakings send out 25 p.ct. of the heat of the original coal through mains and 42 p.ct. of it as coke and tar by road and rail. He cannot resolve coke and tar into gas by a stroke of the pen, as he attempts to do.

The thermal efficiency of a gas-making process must surely be based on the gas made in such process and distributed through main pipe lines, particularly when it has to be compared with the thermal efficiency of another form of heat energy made by the complete gasification and combustion of coal distributed through pole lines. In the transformation of coal into electricity, if 100 parts of coal are taken for the test they are all completely gasified, and the gas then and there consumed in the process. The coal may be said to pass through two stages before it reaches the condition of electricity—gasification, then combustion. In the case of gas, coal passes through but one stage; and for gas people to compare the intermediate stage in the gas process with the ultimate or second stage in the case of the electricity process is an impossible proposition, and leads nowhere. It is at once obvious that it is between the first and second stages that the greatest losses take place—the loss varying with the particular use to which gas is put.

It is the attention of young men more particularly that I am anxious to call to such fallacious arguments as Sir Dugald Clerk uses, which are similar to those so prevalent with others; for bound-up in the present controversy is the aporaisement of the present gas-making processes. I submit that the whole of the arguments adduced in this controversy show that to attempt to compare on a thermal basis a process of electricity generation that does exist with a gas-making process which does not in fact exist, carries us to an *impasse*. Thermal efficiencies as calculated by Sir Dugald Clerk in this connection are worse than useless, and his conclusions cannot be correct that gas as at present made is a process of 46 p.ct. efficiency compared with electricity generation at 8 5 p.ct. efficiency. The fact that he bases his heat and power calculations on the same figure of 46 p.ct. makes them all useless, and their publication will do harm, most serious harm, to all enterprise connected with the gas industry, and bring it into disrepute with our electricity colleagues.

As an appendix, I put a few questions which should help to focus, as it were, the foregoing remarks.

A PERSONAL NOTE.

It is one thing to set out "to correct and inform," and quite another to have the ability to do it. I fear that it is not knowledge that prompts Sir Dugald to set out to inform me on this subject, but mere presumption. He has confirmed my arguments, for which I thank him, and I beg that he will accept them. I have met men of similar type before; and if he does not accept my corrections now, I shall watch to see how long it will be before he adopts, as his own, the very ideas which he refuses to accept openly at my hand. This will not be the first time that he and others have done me this signal honour. The wisest remark of Sir Dugald's, judged from the times it has been repeated, is that "he does not understand my mental processes." I, with much modesty, admit that to do so does require a man to possess some practical knowledge of gas and gas making. When a man finds he is hopelessly wrong, it is sometimes quite good tactics for him to write *finis* to his arguments, and leave another man master of the field. I hope that Sir Dugald will fight to a finish, and just answer the questions I have put to him, not for personal benefit to either of us, but for the good of both gas and electricity, and thus the nation at large.

GEO. HELPS.

Nuneaton, Aug. 21, 1920.

Questions for Sir Dugald Clerk to Consider.

1.—Does he, for his comparison in the case of the gas process, consider that 100 parts of coal are all converted into gas?

2.—Does the diagram fig. 4 represent the imaginary conversion of 100 parts of coal into gas?

3.—Is it correct to say that the comparing fig. 4 is constructed for practical purposes solely by his pen?

4.—Does he accept the illustration fig. 2 as only a partial gas-making process?

5.—Does fig. 4 represent in idea the complete gasification of coal?

6.—Does he, for the purpose of his comparison, diagrammatically construct fig. 4 from fig. 2?

7.—Does fig. 11 represent the intermediate stage of the mental process by which he arrives at fig. 4?

8.—Is a gas-making process as illustrated in fig. 4, or anything like it, in operation at any works—large or small? If so, where?

9.—Does he accept the proposition that the transformation of coal into electricity is fairly considered as a two-stage process—*i.e.*, a process by which the coal is converted first into gas and then the gas simultaneously consumed?

10.—Does he realize that the transformation of coal into gas is only a one-stage process?

11.—What comment is he prepared to make on the proposition that while gas may be looked on as almost the heat itself in some uses, in the generation of electricity the first or gas stage has been carried further, and the heat of its combustion used and converted into an entirely different energy; whereas in the case of power, electricity may be looked on as something near the power itself, and gas only as the source of power?

12.—Can a really scientific comparison be made on a thermal efficiency basis between a process of partial gasification of coal, called erroneously a gas-making process—such as fig. 2 represents—and electricity generation. That is to say, can it reasonably be said that the thermal efficiency of a gas-making process in which 25 p.ct. of the heat of the coal is found in the gas with coke and tar left over as bye-products (which are calculated as if they were converted into gas) is 45 p.ct.?

13.—The efficiency in use of an electric radiator is nearly 100 p.ct.; the efficiency of gas in a fire is, roundly, about half. Will he agree that the thermal efficiencies of gas and electricity production have no useful bearing on such comparisons?

14.—In view of his comment on question 10 and others, does he continue to argue that it is fair to say that, for every 100 heat units in the original coal, the consumer of electricity obtains 7 or 8, while the gas consumer for every 100 heat units obtains 46—a statement which he has hitherto frequently made?

15.—What sort of process—good or bad—does Sir Dugald Clerk think is represented by fig. 2 or 11? Is it one that the gas industry should continue to adopt?

16.—If coke and tar are required, would it not be better for gas undertakings, in his opinion, to adopt a low-temperature carbonizing process for making these bye-products, and incidentally not call such processes gas-making?

Differential Air Thermometers and Recording Calorimeters.

SIR,—I have been very interested in Messrs. Madsen and Herber's article on this subject. Their temperature recorder is a very clever application. As described, the instrument can only give the approximate net B.Th.U.

At Brentford we have installed, and have had working for some time, a recording Boys' calorimeter of our own design, and which gives the total heat value. We are further improving on this in a way that the results can be switched-up electrically at any part of the works and (no matter the distance) direct from the recorder.

The measure of the difference of temperature will be made electrically with an accuracy of one part in five hundred on a very open scale. Within the next few weeks I shall take the opportunity of describing the instrument in the "JOURNAL." At present the instrument is working on differential aneroids, as in the Simmance instrument, and these limit the sensitivity to a few B.Th.U.

I rather imagine that the matter of £50 (or even £100) additional expense on an instrument of this kind will carry no weight with the larger companies if the instrument has greater sensitiveness. If, for instance, an instrument is only accurate with certainty to 10 B.Th.U., then to cover this an extra 10 B.Th.U. must for security be put on the "send-out." A reduced margin of security might well cover the additional cost of an instrument in a very short time.

Brentford Gas Company, Aug. 20, 1920. J. H. FAIRWEATHER.

"Biths."

SIR,—The word "therm" has now statutory authority. "British thermal units" is an unwieldy phrase; and "B.Th.U.'s" is not much better. Therefore why not coin a word, and think and talk in "Biths," as we have now to do in "Therms?" Some may say it is a barbarous word. It is not more so than "Therms;" and it is easy to say, and cannot be mistaken for anything else.

HY. JOHNSON.

Romford, Essex, Aug. 19, 1920.

REGISTER OF PATENTS.

Treating Gases Containing Hydrogen Sulphide. No. 120,554.

LEAMON, W. G., of Wooster, Ohio, U.S.A.

No. 15,568; Sept. 25, 1918. Convention date, Nov. 8. 1917.

This invention relates to the treating of gases containing less than 1 p.ct. of hydrogen sulphide.

The gas to be purified is subjected, in the presence of gaseous oxygen, to the action of heat at a temperature sufficiently high to produce effective dissociation of the contained hydrogen sulphide (about 280° to 300° C. is the optimum) by the aid of porous contact-material, which may carry a more actively catalytic substance, under conditions such that the hydrogen of the hydrogen sulphide is oxidized to water by the reaction with oxygen naturally contained in, or added to, the gas, while the sulphur passes on as such through the purifying system to be mechanically removed as elemental sulphur by some suitable method such as washing. Alternatively, it is also oxidized to a greater or less extent and removed by absorption in a suitable absorbing medium.

The patentee states that he is aware that Burkheiser, in his patent No. 20,920 of 1908, proposed to pass coal gas or the like over a heated oxygen-yielding mass, such as bog iron ore, at temperatures from 140° to 400° C., and to regenerate the mass continuously by adding oxygen. In the present process an inert contact material is employed. Such contact materials are not broadly novel in connection with the oxidation of gases containing high percentages of sulphur—such as the gases of the Chance-Claus process, in which it has been proposed to obtain sulphur by adding sufficient atmospheric oxygen to combine with the hydrogen of the hydrogen sulphide, and by passing the gases through a bed of heated inert porous material.

A principal object of the invention is to completely remove hydrogen sulphide from gases—such as natural gas, coke-oven gas, producer gas, illuminating gas, &c.—and while the method is of general application, it is particularly adapted to the purification of fuel gases of the general character specified. It is also applicable to other fuel gases, such as oil gas and the like.

Gas-Condenser.—No. 124,428.

RYFFEL, F., of Salerno, Italy.

No. 5397; March 4, 1919. Convention date, March 4, 1918.

This condenser is constructed with co-axial tubes, through the outer of which the gases pass in a downward direction, while the water flows upwards through the inner tubes to a sprinkling device which distributes the water over the outer tubes. A tank is arranged over the

entire upper part of the condenser, and is supplied with the cooling water after its passage through the series of inner tubes; the tank being provided with holes through which the water falls in a spray, or trickles, on to the tubes of the condenser.

Analyzing the Volatile Constituents of Coal. No. 147,254.

NAITO, A., of Tokio, Japan.

No. 8708; April 7, 1919.

This invention relates to apparatus for effecting the quantitative separation and estimation of water, tar, and gas contained in the volatile products of the coal when subjected to dry distillation.

The patentee proposes to use, in conjunction with a washer for intercepting the tar and other soluble constituents, a reservoir consisting of an inner bell or bottomless tank having connection with the washer and an outer tank (with a discharge cock) adapted to be filled with water which, when an estimation is to be made, is allowed to be discharged by opening the cock for the dual purpose of maintaining an aspiration on the washer and for enabling the volume of the insoluble gaseous constituents of a charge (which pass through the washer to the receiver) to be ascertained by measuring the volume of water displaced from the receiver by the gas.

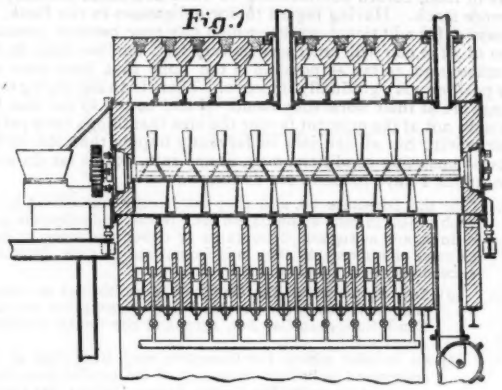
Furnace Retorts.—No. 132,487.

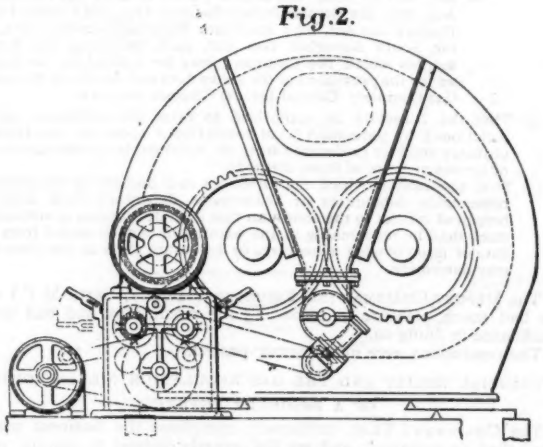
SMITH, C. H., of Short Hills, New Jersey, U.S.A.

No. 9768; April 16, 1919. Convention date Sept. 9, 1918.

This is a further development of the invention alluded to in the "JOURNAL" for July 28, p. 192—for a furnace retort constructed to effect the partial distillation or carbonization of coal in order to eliminate part of the volatile hydrocarbons and "obtain a uniformly but partially distilled residue."

The furnace retort mechanism is characterized by the fact that the retort has a paddle shaft journalled in bearings which permit of limited universal movement of the propeller shaft—as by ball-and-socket members. Where exposed to the heat of the furnace, it is constructed of calorized steel adapted to withstand the heat necessary to effect the partial distillation or carbonization of the coal within the retort, and because the heat can be readily transmitted through the metal to the





Smith's Furnace Retort.

coal charge being treated within the retort. The portion of the retort exposed to the heat of the furnace fires is preferably a horizontally and longitudinally extending tubular shell that is in cross-section of modified inverted heart-shape; and within the shell there is preferably located a pair of parallel longitudinally extending paddle carrying shafts for mixing the charge within the retort and for progressively conveying it from the forward end of the retort to the discharging end.

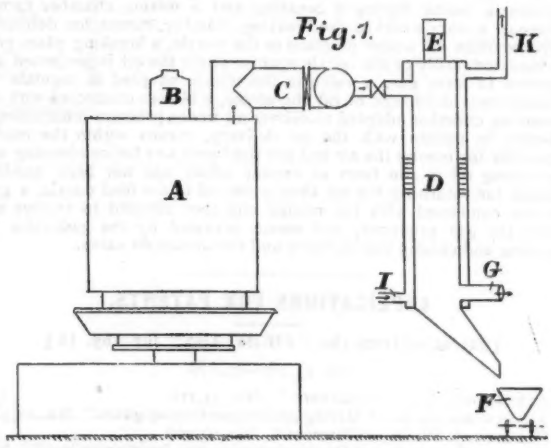
Mention has heretofore been made of the means for feeding the coal to the interior of the retort and of the mixing and conveying devices—paddle-carrying shafts. The feeding means and the mixing and conveying means can both be operated from a common source of power; and in the construction shown there is employed a set of change-gearing whereby, at the will of the operator, the mixing, conveying, and feeding means can be run at a desired selected speed from a constant-speed motor.

As showing a specific embodiment of the invention, reference is made to the illustrations. Fig. 1 is a vertical and longitudinal sectional view showing the upper portion of the furnace-retort. In this figure, there clearly appears the mixing and conveying means, and there is also indicated the feeding means. Fig. 2 shows the outer end plate at the front end of the retort. In this view there are also shown, in association with the end plate, the gears for driving the paddle-carrying shafts of the mixing and conveying means, the means for feeding the coal charge to the interior of the retort, and the motor and gearing, including the change gearing, whereby the paddle-carrying shafts and the feeding means can be operated from the motor, each at a desired selected speed.

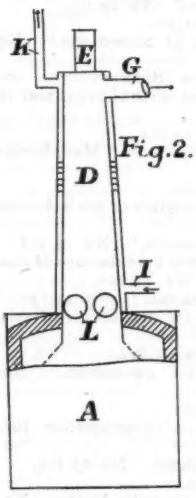
Destructive Distillation of Solid Fuels.—No. 147,311.

BESWICK, W., and RAMBUSH, N. E., of Stockton-on-Tees.

The destructive distillation of solid fuels, by passing hot gases or vapours through the fuel, has frequently been recommended (the patentees remark), particularly when low-temperature carbonization is the object; and they claim to have found that bye-product producer gas which is not abnormally hot contains, as it leaves the producer, the proportion of steam to producer gas which gives the best result in the internal distillation of ordinary fuel in respect of yield of



Beswick and Rambush's Gas Producer.



the more valuable products—particularly ammonia. So their invention consists in the combination of a normally operated bye-product producer of the Mond type with an internally heated gas-retort, such that the hot crude bye-product producer gas passes directly into the retort, without substantial cooling.

In fig. 1 A represents a producer of the ordinary kind, of which B is the fuel-hopper and C the gas outlet pipe. From this pipe the gas is distributed to vertical retorts D, each having a feeding device E and a discharge F at the bottom for the coke into trucks or the like. The gas from the producer enters at the top of the retort, and leaves at the bottom through an outlet G.

When the retort requires external heating, some of the producer gas or other heating medium may be introduced at I into flues surrounding the retort, there to be burnt—the combustion products leaving at K. The mixture of producer gas, any excess of steam, and the volatile products of distillation of the fuel in the retort, pass from the outlet G to the purifying plant. Without external heating, a temperature of (some) 300° C. may generally be finally attained in the retort.

In fig. 2, the retort D is placed directly over the producer A, so that the coal which is being carbonized is fed continuously to the producer; being passed through a breaking device L on its way.

Retort Mechanism.—No. 147,965.

SMITH, C. H., of Short Hills, New Jersey, U.S.A.

No. 3917; Feb. 17, 1919.

This invention, which is related to patent No. 132,487 *supra*, refers to retort mechanism especially suitable for use in the distillation of coal—more particularly to that type of plant in which the coal is moved progressively along the retort by means of a rotary paddle shaft or paddle shafts, and provides reducing change-speed gear for driving the shaft or shafts, and improved paddle shaft bearings and supports therefor.

The arrangement is not further described apart from a series of ten sheets of closely-lettered drawings.

Making Gas.—No. 148,027.

Campbell, D. E., of Modesto, California.

No. 13,607; May 29, 1919.

This invention relates to apparatus for converting hydrocarbon oils into gas, wherein the oil is "mechanically broken-up to form a gas without the assistance of heat or subjection to a heat-cracking operation, and, furthermore, is mixed with air in a permanent manner." After a lengthy specification, the patentee claims as his invention:

1.—Apparatus for making gas comprising means for subjecting hydrocarbon oil in the form of a high-velocity jet to violent concussion against an anvil surface, and means for simultaneously mixing the gas produced with air.

2.—Apparatus, according to claim 1, comprising means for applying pressure to a confined body of hydrocarbon oil and means for liberating the oil and projecting it against a breaking member.

3.—Apparatus, according to claim 1, comprising a container having a breaking chamber formed therein, a nozzle within the chamber, means for delivering hydrocarbon oil thereto under pressure, a breaking plate positioned in front of the nozzle against which the oil is projected and broken to form gas, and means for delivering air to the chamber during the breaking operation—the delivery of oil and air taking place intermittently.

4.—Apparatus for making gas, according to claim 3, in which a casing forming a continuation of the breaking chamber is provided with means for mixing the gas produced with the air and for condensing and collecting oil globules and vapour.

5.—Apparatus for making gas, according to claim 1, 2, or 3, comprising a casing having a breaking and a mixing chamber formed therein, a nozzle within the breaking chamber, means for delivering hydrocarbon oil under pressure to the nozzle, a breaking plate positioned forwardly of the nozzle against which the oil is projected and broken to form gas, a valve in the nozzle adapted to regulate the intermittent discharge of oil therefrom, a blower connected with the breaking chamber adapted to deliver air under pressure intermittently thereto in unison with the oil delivery, means within the mixing chamber for mixing the air and gas produced and for condensing and collecting oil in the form of vapour which has not been gasified, means for returning the oil thus collected to the feed nozzle, a gasholder connected with the mixing chamber adapted to receive and store the gas produced, and means actuated by the gasholder for opening and closing the air-valve and the oil-nozzle valve.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Aug. 18.]

Nos. 23,269—23,826.

Alexander, A. E.—"Burners." No. 23,316.
Alexander, A. E.—"Mixing and proportioning gases." No. 22,318.
Balfour, J. W. B.—"Burners." No. 23,766.
Barrett Company.—"Production of resins from naphthas." No. 23,454.
Barrett Company.—"Manufacture of coke." No. 23,455.
Best, Inc, W. N.—See Alexander. No. 23,316.
Coke & Gas Ovens, Ltd.—"Gas-burners of coke-ovens." No. 23,622.
Collin Akt.-Ges. zur Vertwertung von Brennstoffen und Metallen, F. J.—"Means for closing doors of vertical ovens and retorts." No. 23,345.
Ewart, J. W.—"Non-return valves." No. 23,704.
Farbwerke vorm. Meister, Lucius, & Brüning.—"Manufacture of methane." No. 23,446.
Gibbs, A. C.—"Cooking-ovens." No. 23,409.
Harris, W.—"Means for economizing consumption of gas in bunsen burners, &c." No. 23,590.
Jennings, G. L.—"Means for plugging gas-mains." No. 23,348.
Keillor, F. B.—"Combination plant for the manufacture of coal gas, blue water gas, and coal tar or oil gas." No. 23,700.
Schroeter, G.—"Hydrogenation of naphthalene." No. 23,530.
Sheringham Daylight Ltd.—"Reflectors for production of artificial daylight." No. 23,639.
Smee, A. R.—See Coke and Gas Ovens. No. 23,622.
Smith, E. W.—"Coin-freed mechanism for gas-meters." No. 23,327.
Smith Meters, Ltd.—See Smith. No. 23,327.
Soc Anon. Fours et Procédés Mathy.—"Regenerative furnaces." No. 23,497.
Surface Combustion Company.—See Alexander. No. 23,318.
Tetralen Ges.—See Schroeter. No. 23,530.
Thompson, W. P.—See Soc. Anon. Fours et Procédés Mathy. No. 23,497.
Turing, H. D.—See Sheringham. No. 23,639.
Wells, J. F.—"Application of gas and liquid fuel firing to boilers and furnaces." No. 23,611.
Wingfield, E. R. H.—See Jennings. No. 23,348.

Woodall-Duckham Verticals for Lanark.—The Lanark Town Council have approved of the minutes of the Gas Committee recommending an installation of vertical retorts. The cost of the Woodall-Duckham system will be £18,379.

Widnes and Cheap Gas.—During the annual inspection of the Widnes Corporation Gas-Works, Mr. Isaac Carr (the Engineer) referred to the price of gas there as compared with certain other places. He declared that, as far as production went, Widnes always had produced, and was still able to continue to produce, the lowest priced gas. He was, however, up-against communities that could sell coke at three or four times the cost of coal; and this enabled them to undersell their gas. Had he the same market for coke as had his competitors on the north-east coast, he would undersell them in gas as much as ever he did.

MISCELLANEOUS NEWS.

SOUTH SUBURBAN GAS COMPANY.

An Extraordinary Meeting of the Proprietors of the Company was held at the Cannon Street Hotel, Cannon Street, E.C., last Friday—Mr. Charles Hunt presiding—for the purpose of: (1) Authorizing the Directors from time to time to issue any capital which still remains to be raised under the provisions of the Crystal Palace District Gas Act, 1893, and the South Suburban Gas Acts, 1912 and 1918; and (2) authorizing the Directors from time to time to exercise the borrowing powers of the Company.

The Secretary (Mr. Wilfrid Wastell) read the notice convening the meeting.

The Late Sir John Boraston.

The Chairman: Before commencing the business of the meeting, feel I must refer to the great and sad loss which the Company have recently sustained by the death of Sir John Boraston. It will be remembered that Sir John was at our meeting last February, apparently in full health and vigour; and his illness and death only a few weeks afterwards came to all of us as a great and painful shock, for Sir John had endeared and attached himself to everyone with whom he came into contact by his many sterling qualities of both head and heart. We feel sure proprietors will approve of our having chosen as his successor on the Board one of the rising generation, in the person of his son, Mr. J. H. Boraston, who throughout the war had proved himself to be a worthy son of a worthy father.

Unissued Capital and Increase of Borrowing Powers.

The object of the resolutions which I am about to propose is, in the first place, to empower the Directors to issue, as may be required, the balance of about £310,000 of unissued capital authorized under the Company's Acts of 1893, 1912, and 1918; and in the next place to authorize an increase in the borrowing powers of the Company to one-half the paid-up capital in place of one-third as heretofore, in accordance with the Public Utility Companies (Capital Issues) Act, 1920. This increase will enable the Company to raise at such time or times as may be suitable an additional £150,000, or thereabouts, by way of loan, before commencing to raise additional ordinary or preference stock. Having regard to our obligations to the Bank, and the necessity for additional works, which has now become pressing, this sum of £150,000 will not carry us very far; but we shall do our best to make it go as far as possible in the hope that from now onwards the position may gradually improve. There is an old saying that when things are at their worst they mend. I feel bound to say that the portents do not at the moment favour the idea that things have yet reached their worst; but all can join in fervently hoping that the end of the present upsetting conditions may, at any rate, not be far distant. The resolutions I have to move are as follows:

(1) That the Directors be, and they are hereby, authorized to raise at such times, in such amounts, on such terms, and subject to such conditions, and as regards debentures or debenture stock at such rate or rates of interest, as they may from time to time determine, not exceeding 7 p.ct. per annum,
  (*a*) Any capital which the Company is authorized to raise under the provisions of the Crystal Palace District Gas Act, 1893, the South Suburban Gas Act, 1912, and the South Suburban Gas Act, 1918.
  (*b*) All monies which the Company may from time to time be authorized to borrow in respect of the capital actually issued and paid up under the Crystal Palace District Gas Company's Act, 1858, the Crystal Palace Gas Act, 1873, the Crystal Palace District Gas Act, 1893, the South Suburban Gas Act, 1912, and the South Suburban Gas Act, 1918, including any further monies which the Company may be authorized to borrow under the provisions of the above Acts and the South Suburban Gas Company (Capital Issues) Consent Act, 1920.

(2) That the Directors be authorized to raise the additional capital sanctioned by paragraph (*a*) of resolution 1 above by the issue of ordinary stock or preference stock or redeemable preference stock, or by one or more of those methods.

(3) That any monies which the Directors may borrow by the issue of redeemable debentures or redeemable debenture stock shall be borrowed subject to the condition that such debentures or debenture stock shall be redeemable at the expiration of such period from the date of issue of such debentures or debenture stock as the Directors may determine.

The Deputy-Chairman (Sir Fortescue Flannery, Bart., M.P.) said he had much pleasure in seconding the resolutions, and had every confidence in doing so.

The resolutions were unanimously passed.

Financial Relief and the Gas Regulation Bill—Promise of a Brighter Future.

The Chairman: That, gentlemen, completes the business which has called us together; and we feel greatly obliged to you for your attendance, despite the allurements of the holiday season. Before we separate, I should, if I may, like to say a word or two as to the present position with regard to financial relief—a subject which has for a very long time been uppermost in the minds of many gas proprietors. We are very glad indeed to be able to tell you that this relief is at last in sight. At all events, the long-promised and anxiously awaited Government measure was introduced about the middle of May; and I may say at once that had it appeared a few weeks earlier, we should not have needed to trouble the Lords Committee with the financial clauses of our Bill. These had for their main object the protection of the Company against a suggestion made to the Board of Trade by the National Gas Council, with which it was impossible for us, in the interests of this Company, to agree. But there is no trace of this sugges-

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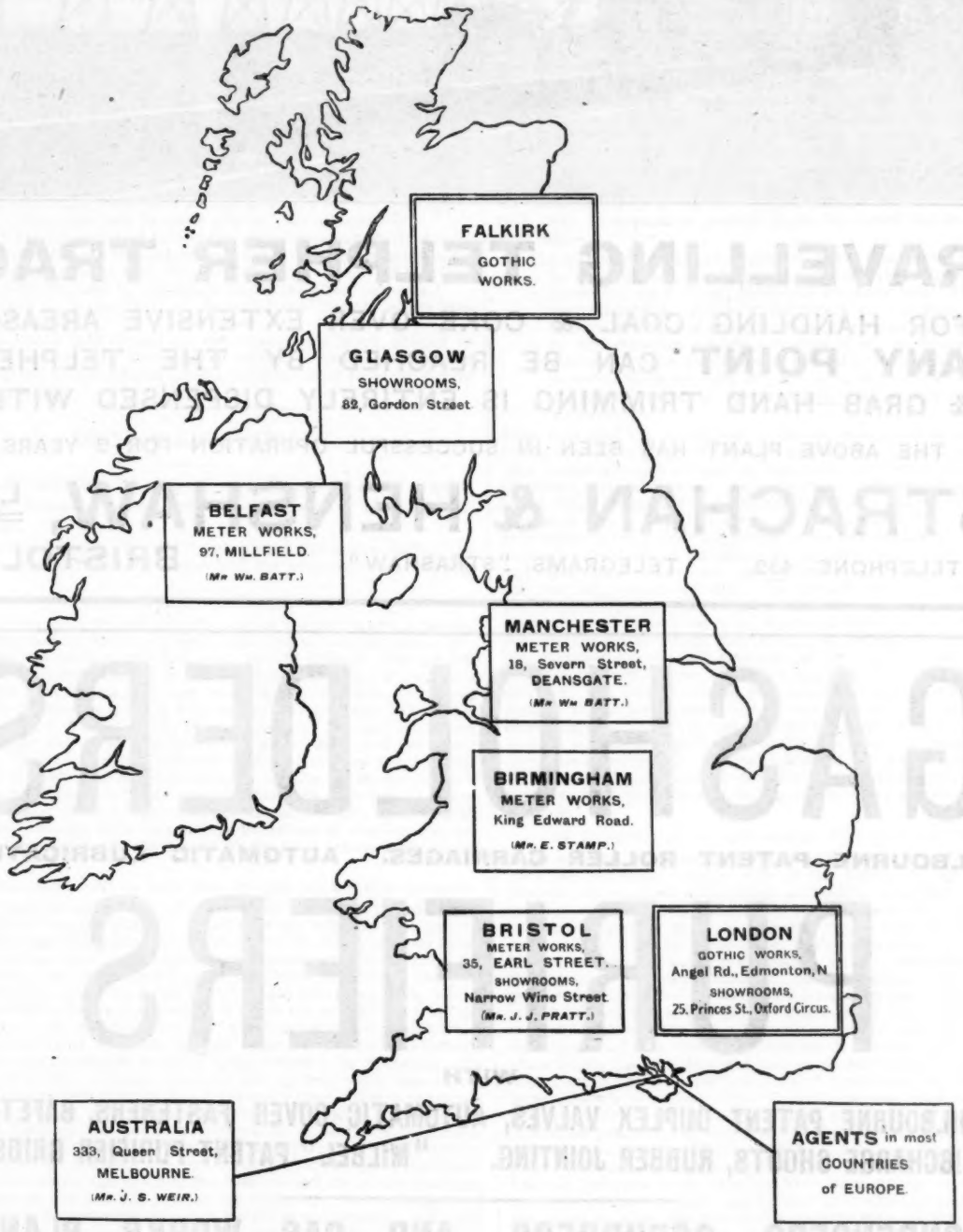

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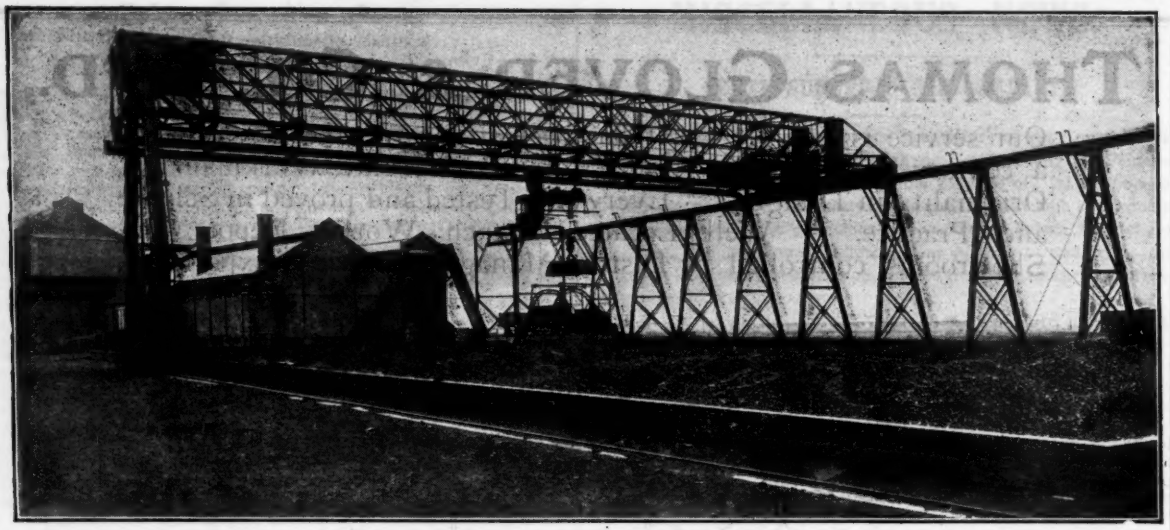

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tion in the Government measure, with which our fortunes as regards financial relief are now linked. Our own Bill, *minus* the financial clauses, and giving the Company additional land at Belvedere for manufacturing purposes, with power to raise half-a-million more capital, *plus* the usual borowing powers, passed unopposed through its final stages in Parliament, and in due time received the Royal Assent. It can hardly be necessary for me to trouble you with the general provisions of the Gas Regulation Act, which is a comprehensive and far-reaching measure, dealing with many gas matters which have hitherto devolved upon Parliament. Our chief interest for the moment centres in the relief clause, according to which provision is first made for revision of existing standard or maximum prices by the addition to them of the extra costs and charges of and incidental to the production and supply of gas which have unavoidably occurred since June 30, 1914, the object of which is to restore to gas companies their pre-war positions. But it is also provided that these new standard or maximum prices shall be revised "if at any time it is shown to the satisfaction of the Board of Trade that the costs and charges of, and incidental to, the production and supply of gas have substantially altered from circumstances beyond the control of, or which could not reasonably have been avoided by, the undertakers." Thus the principle of the sliding-scale is effectually upheld, while at the same time any repetition of the disastrous financial experience of the last few years should prove to be practically impossible. The fairness, under present conditions, of revision either way according to circumstances beyond the control of the undertakers is not likely to be questioned—least of all by this Company, because of the provision which was made for it in the revision clauses of our Bill. In fact, our judgment on this important matter is fully endorsed by the Public Act, which appears to us to bring with it the promise of a brighter future for the gas-supply industry. I have now only to thank you for your attendance.

Mr. G. READ CLARKE said before the proprietors parted, they must pass a vote of thanks to the Chairman for his lucid explanation with regard to capital powers and the new legislation. They all felt that what was done for them by the Board was in their best interests.

Mr. ERNEST F. DREW, F.C.A., seconded the motion, which was very heartily carried.

The CHAIRMAN said he and his colleagues were much obliged to the proprietors for their kind vote of thanks. They ought really to apologize to the proprietors for having brought them together during the holiday season.

CROYDON GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

INDISPOSITION OF DIRECTORS.

The CHAIRMAN, in moving the adoption of the report and accounts, said on this occasion the Board were *minus* two of their number. Mr. Russell, he was sorry to say, had been very ill indeed. But he was pleased to learn from a letter he had had from him a day or two since that he was at Worthing, was very much better in health, and hoped to be with them again early in September. He had also had a letter from Mr. Henry Woodall, who, he was also sorry to report, had been obliged under the doctor's order to take a rest, as he had been hard worked. In his letter, Mr. Woodall remarked that he was sure the results of the half year would be pleasant reading for the proprietors. The Company were in a better position than any suburban gas company, and their price for gas was the lowest. When, Mr. Woodall added, the Company were able to take advantage of the Gas Regulation Act, they would reap the benefit of the good management of the past.

GAS REGULATION ACT—A NEW ERA IN THE INDUSTRY'S HISTORY.

The half year that had just ended was one which would be memorable in the annals of the gas industry. It had seen the redemption of the promise made that legislation should be passed to rectify the anomalies that had arisen out of the changed circumstances brought about by the war. But it had seen more than this. Under the title of the Gas Regulation Act, 1920, there had been brought into being what would in all probability prove the opening of a new era in the history of the gas industry, one in which they well might hope for, and anticipate, developments which were not possible under the restraining influences of pre-war gas legislation, much of which ceased to be in keeping with the facts of to-day. Further—and this had not he thought been much, if at all, commented upon so far—it marked a great stride in the direction of devolution of parliamentary work; for, while retaining unimpaired (through the power of approval or of veto) the paramount authority of Parliament, it delegated to a Department having special qualifications for the work the power and duty of adapting the conditions under which the gas business was carried on to the changing circumstances which might come about hereafter. The provisions of the Act were too many and varied to permit of any attempt on his part to adequately summarize them that afternoon; but he made no apology for trying to indicate briefly the essential nature of the changes that would shortly come about. The Act gave to the Board of Trade power to make Orders which (he quoted the terms of the Act) might—

> "Provide for the repeal of any enactments or other provisions requiring the undertakings to supply gas of any particular illuminating or calorific value, and for substituting power to charge for thermal units supplied in the form of gas."

This was a far-reaching provision. He had often pointed out that the requirement of maintaining a given standard of so-called "illuminating power" (meaning the light given, not when burned by an incandescent burner, but by the inefficient and obsolete flat flame) often deprived gas undertakings of the power to avail themselves of methods of manufacture which would permit better real value to be given to their consumers. It was true that of recent years many gas undertakings (their own among the number) had obtained the substitution of a "calorific" or heat-giving standard. But this in itself did not go quite far enough. It had come to be realized that, under varying circumstances of geographical position (which largely governed the relative prices of raw materials and of residuals), and of facilities in regard to available plant and so forth, the kind of gas which one undertaking could most advantageously supply was not the kind by which another undertaking could give the best value to its customers. Moreover, for any given undertaking, circumstances would change from time to time. Up to now, no better means had been found (for the protection of consumers' interests was, it must be recognized, essential) than to fix a relation between price charged and dividend payable, coupled with a fixed standard for the character of the gas. This standard could only be altered by cumbrous, expensive, and lengthy methods of official procedure. Henceforward, when the new Act became operative in regard to any undertaking, that undertaking would be free from time to time to determine for itself the kind of gas it would supply, under conditions ensuring that the interests of its consumers were identical with those of its proprietors. This result was secured by providing that hereafter gas should be charged for, not directly according to the volume supplied as hitherto, but according to the number of heat units it would give out when burned. The new standard was to be known as the "therm;" and without going into technical details he might explain it by saying it represented an amount of heat slightly exceeding that which could be obtained from 29 electrical units. Provision was also made that the standard or maximum price might from time to time hereafter be altered by the Board of Trade, should circumstances so require, on the application of either the undertakers, the local authority, or of twenty consumers. But the Act did more than this. It went on to provide (again he quoted the words of the Act) that—

> "The standard or maximum price per therm fixed by the Order shall be a price corresponding as nearly as may be to that fixed by those [*i.e.*, the existing] provisions for each 1000 c.ft., but with such addition as appears to the Board [*i.e.*, the Board of Trade] reasonably required in order to meet the increases (if any) due to circumstances beyond the control of, or which could not reasonably have been avoided by, the undertakers, which have occurred since the 30th of June, 1914, in the costs and charges of, and incidental to, the production and supply of gas by the undertakers."

Here they had the redemption of the promise given to the industry during the war that the unfortunate position in which gas undertakings were placed, through no fault of their own, and despite the many and important national services they were rendering, should be amended. What these increases in cost amounted to in their individual case would be readily seen if he gave a gross cost of gas supplied per 1000 c.ft.—after allowing for increased expenses on the one hand, and for improved prices for residuals on the other—in the half years ended June, 1914, and June, 1920. They were 1s. 11d. and 3s. 11d.—an increase of 2s. per 1000 c.ft., or over 100 p.ct. Incidentally he might mention that the receipts from gas per 1000 c.ft. sold had, between these periods, been increased by only 79 p.ct., while the amount per 1000 c.ft. sold required for the dividends paid in 1914, as compared with those they now proposed to pay, had been reduced by 31 p.ct. Needless to say, the Directors would lose no time in applying for an Order under the new Act; and while he feared they could not hope for any readjustment of the dividend conditions in this December half year—in fact, there might be a slight decrease—they might expect that justice would be done to their long-suffering stockholders when they came to declare dividends a year hence. He had spoken of this matter at some length, for its importance required that the altered conditions they would hereafter work under should be known as widely and as accurately as possible.

THE PUBLIC UTILITY COMPANIES (CAPITAL ISSUES) ACT.

There was one other Act passed this session to which he must refer. It bore the somewhat lengthy title of the Public Utility Companies (Capital Issues) Act, 1920, which sufficiently described its purport. An application under it had already been made to the Board of Trade by the Directors for power to raise the capital required by the Company under conditions conformable with those ruling in the Money Market to-day; and at the extraordinary general meeting to be held at the conclusion of these proceedings, the proprietors would be asked to pass the resolutions which had been framed by the Company's solicitors as necessary to enable the Directors to act under these powers as soon as they were obtained. It would be understood that much of the development of their works and plant which would normally have taken place during the past six years had of necessity been postponed, and must now be carried out at prices which would call for the raising of large amounts of capital. This expenditure was quite unavoidable; but, when the new plant under erection was completed, they would be in a better position than they were to-day to effect continuous economies in manufacture. This would be appreciated when he told the proprietors that so little margin of manufacturing and storage plant had the Company to-day that for five winter months of the year the resources of the Engineer and his staff were strained to the utmost in the effort to meet the day-to-day requirements of their customers. Under these conditions they were frequently obliged to consider, not how they could manufacture gas most cheaply, but how they could from day-to-day produce enough to satisfy the demand. They were completing the new gasholder which was commenced before the war; adding to the capacity of the carburetted water-gas plant and the purifying plant used in connection with it; remodelling and increasing the manufacturing capacity of the No. 1 retort-house; erecting high-pressure plant and laying special mains to increase the pressure at which gas was supplied in several rapidly growing parts of the district. These commitments, with the general expenditure on additional mains, services, and the like, would require an outlay of some £200,000 within the next two to three years.

"D" STOCK ISSUE WITHDRAWN.

He might mention here that the issue of "D" stock to consumers and employees made in December had been withdrawn, as the compe-

tition of other avenues for investment on terms giving a greater return to the investor had robbed it of its attractiveness. In all, the sum of £39,088 had been raised in this way since last December, in addition to £24,702 similarly raised up to June of last year.

THE ACCOUNTS—PROGRESS OF BUSINESS.

Coming now to the accounts for the past half year, they would, he believed, be regarded as satisfactory, and did not call for more than brief comment. The proprietors would see the sales of gas continued to increase very satisfactorily. The sale of gas was 68 million cubic feet, equal to 7·61 p.ct., more than in the corresponding half year of 1919. The output up to date showed no signs of slackening in its growth; and when the housing developments of the near future began to mature, they would have to meet a considerable demand from residents in these additional houses, practically all of which were being planned with a view to extensive use being made of gas. In fact, as he had already indicated, the steadily growing demand for gas, while most satisfactory, was at the moment almost a source of embarrassment to the Company. The gas consumers had increased in number by 393. Stoves on hire were less by the small number of 160. This was due solely to the fact that at the moment they had found it necessary to suspend the supply of stoves other than by way of sale; and against this had to be set the fact that they had sold outright to consumers 1467 stoves, besides large numbers of other appliances, for the use of gas. It would be noted that an advance of 2d. per 1000 c.ft. had been made in the price of gas as from July. The proprietors were sufficiently aware of how rapidly the cost of wages and of all materials had been rising, to realize that an advance was inevitable; and the amount by which they had increased the price was, relatively to these added costs, a very small one. An increase of workmen's wages equal to 6s. 9d. per week took effect, under a national settlement with the unions concerned, in May. Already demands for a further increase in wages were being put forward. The proprietors would not expect him to say much on this head; but he would point out that a time must come when economic circumstances would place a limit on the expenses which an industry could bear under this heading. Residuals, particularly tar, had realized good prices. They might reasonably conclude that this residual had now won a position which would make it a more profitable one to the Company than it was in past years.

COKE SALES AND EXPORTS.

With regard to coke, he would like to say a word of explanation, which he hoped might dispel some misunderstandings. Latterly, where a gas undertaking had had surplus coke over the requirements of its immediate district, licences to export the surplus had been granted, and very high prices had been realized in this way by some temporarily fortunate undertakings. Recently a price as high as £12 per ton had been quoted as having been obtained by an undertaking situated close to the Northern coal-fields, and thus able to obtain coal at much less expense than undertakings in the south. Had their Company been able to make sales of this character, their receipts from coke would have been higher by many thousands of pounds than they were; and they would have been able to sell gas at much lower prices than the very moderate ones they charged—probably, indeed, they would have been able to sell at less than the pre-war prices. But they had found the demand in their immediate district and from their wonted customers sufficient to absorb all, and more than all, the coke they had had available for sale. The price which they could charge for coke for home use was still controlled; and the average price of the sales last half year was about £2 4s. 6d. per ton. Even if they could obtain licences to export coke, the Board considered that regard should be had to the requirements of their regular customers; and he felt sure, that when the present abnormal circumstances of the coke market had passed—as pass they must—they would find that the policy they had followed, if not immediately the most profitable, would prove to be a sound one in the long run.

THE COAL REBATE AND GAS ALLOWANCE.

One other explanation, and he would not further trespass upon the patience of the proprietors. The reduced price of coal supplied for domestic and household purposes, which came into force unexpectedly last December, was as suddenly withdrawn by the Government on May 11. As the proprietors knew, gas undertakings were in this matter merely the channels through which this allowance was passed on to the users of gas for domestic and household purposes. They had to fix the allowance, by estimation, at such a figure as should give to consumers as nearly as possible the allowance received from the collieries, less a small proportion to be retained by the Company to meet the expenses entailed. The Company made an allowance at the rate of 6d. per 1000 c.ft. on gas supplied in the Lady-day quarter, and were able to increase this to 9d. for the whole of the Midsummer quarter. He was glad to say this estimate had been justified, as the allowances made were just met by those they had received, though the margin left to the Company for expenses was somewhat less than that which they could have retained. The proprietors would see by the Directors' report that they were proposing to pay the statutory dividends—and a resolution to this effect would be moved—leaving £4110 to carry forward.

The Deputy-Chairman (Mr. Thomas Rigby) said he thought the proprietors would agree with him that it was a long time since they had had such a cheering statement from their Chairman. This, taken in connection with the half-yearly accounts, augured well for the prosperity of the Company in the future. He had much pleasure in seconding the motion.

The motion was unanimously adopted.

THE DIVIDENDS.

Mr. William Cash, F.C.A., moved the declaration of the statutory dividends for the half year at the following rates per annum, less income-tax: On the "A" stock, 10½ p.ct.; on the "B" and "C" stocks, 7½ p.ct.; on the "D" stock, 5 p.ct.; and on the "E" stock, 7½ p.ct. He remarked that these were the statutory rates of dividend the Company were entitled to pay, having regard to the price of gas. They were dividends at the same rate as during the half year ending December, 1919; but, of course, they were lower than they were twelve months ago in respect of the half year ending June, 1919. The Company were not in a position to claim any relief under the Temporary Increase of Charges Act. The proprietors would have to wait for larger dividends until there was a restoration of the position of the Company, through an application to the Board of Trade under the Gas Regulation Act which had just been passed. In these circumstances, and having regard to all the facts of the position, he thought the proprietors would be glad to learn of, and be satisfied with, the results shown by the half-year's accounts. As the Chairman had said, after paying these dividends there would be left to carry forward the sum of £4110, as compared with £1679 brought into the half year; so that they had earned the dividend and a little bit more. Unfortunately, there were no signs of a decrease in working costs. This undertaking, like all others, was faced with this matter; and, indeed, as they knew from what had been seen in the Press, they were confronted at the present moment with indications that labour thought they ought to have a further increase in wages. The only thing that could at the moment be said under this head was that labour did recognize that the owners of capital in gas undertakings were entitled to consideration, and so supported the passing of the Gas Regulation Act, which would give back to gas undertakings the increased costs which had arisen during the war.

Mr. Percy H. Hall, J.P., in seconding, said he hoped that this time next year, in view of the passing of the Gas Regulation Act, the Company would be in a position to make a somewhat better distribution. He dare say there would be some difficulties; but he thought in the end they would get justice, and would then be able to distribute the dividend they ought to have.

VOTES OF THANKS.

Dr. Rodwell proposed a vote of thanks to the Chairman and Directors. He said he had no diffidence in submitting this resolution, because the proprietors had proof of what these gentlemen did for them in the statement that had been made so clearly by Mr. Hussey and elaborated more particularly on the financial side by Mr. Cash. In the report they had evidence of good work. At the present time, the position was one of great strain; and he felt that, on an occasion when they had such hopes before them of improved conditions, this resolution would receive very cordial support.

Dr. Critchley seconded the motion, which was heartily carried.

The Chairman, on behalf of his fellow Directors and himself, thanked the proprietors most heartily. It was a great pleasure to know that their conduct of the business met with the appreciation of the proprietors. They had had difficulties to contend with; but they had fortunately been able to overcome them. He had been delighted to be able to announce the passing of the Act which they hoped and believed would enable them to pay better dividends after they were able to conform with its provisions. There was some preliminary work to get through, before they could obtain the Order authorizing them to put themselves in a position to pay a better dividend, which the proprietors thoroughly deserved. Proceeding, he said it was a pleasure again to propose a resolution which he had submitted now, twice annually, for some 27 years; and the pleasure was as great as ever. It was a vote of thanks to their officers, staff, and workmen for their efficient services during the half year. No company could be better or more zealously served. Officers, staff, and men alike, all did their duty; and with their men they were on the best of terms. He hoped, and they all hoped, this would continue for many years to come. The Company had some old employees whose services they valued very much indeed; and their relations he trusted would not be severed for many years.

Mr. Samuel Spencer, in seconding, said he had a very long experience in the gas industry; and he could say that no company or municipality had officers whose diligence exceeded that of their own.

The motion was cordially passed.

Mr. A. Caddick (Engineer and Works Manager) acknowledged the vote on behalf of all engaged in the manufacturing department. His personal thanks were also due to those who had so ably assisted him during the past half year in carrying on the works. The proprietors would have noticed from the Chairman's speech that the increase in the consumption of gas sent out in the half year represented 7·6 p.ct. It might interest them to know that between July 1 and the previous day the consumption had increased by 13·3 p.ct. on an increase in the corresponding period of last year of 10·5 p.ct. The Chairman had referred in his address to the demands for gas being met; and the proprietors could imagine from these figures that, if the coming winter was a hard one, without additional plant to bring into use, those responsible would have a very difficult time. He hoped, however, with those associated with him, they would be able to pull through—at any rate, no effort would be spared to maintain the supply of gas.

Mr. Topley, on behalf of those associated with him in the secretarial department, as well as on his own account, thanked the proprietors for their cordial acceptance of the kindly words used by the Chairman and Mr. Spencer. It heartened one to know that one's efforts were appreciated. This really counted for something. He personally desired to express his acknowledgments of the splendid and zealous help he had had from all in his department. They would all turn to the work in front of them, sharing to the full the pleasure that he knew the proprietors felt in hearing that the Company, like others, after passing through stormy times, had now well-assured hopes of fair weather.

Mr. W. J. Sandeman, on behalf of the Distribution and Sales Department, said he could assure the proprietors that the vote was greatly appreciated by them all. The gas industry, in common with all other industries, was passing through very difficult times; but he felt, so far as their Company was concerned, that the men were doing their best to help them, and that the Company had a gas-selling district second to none in the country.

EXTRAORDINARY MEETING.

STOCK ISSUES UNDER THE PUBLIC UTILITY COMPANIES (CAPITAL ISSUES) ACT.

An Extraordinary Meeting was next held for the purposes set forth in the following resolutions, which were read by the Secretary:

(1) That the resolutions passed at the extraordinary meeting of the pro-

prietors held on the 21st day of August, 1914, the 23rd day of February, 1917, and the 22nd day of August, 1919, so far as any moneys still remain to be borrowed under the authority thereof, be rescinded.

(2) That the Directors be, and they are hereby, authorized to raise at such times, in such amounts, on such terms, and subject to such conditions, and at such rate or rates of interest, as they may from time to time determine, all moneys which the Company may from time to time be authorized to borrow in respect of the capital issued and paid-up under the Croydon Gas Act, 1866, the Croydon Gas Act, 1877, the Croydon Gas Act, 1894, the Croydon Gas Act, 1904, and the Croydon Gas Act, 1905, including any further moneys which the Company may be authorized to borrow under the provisions of the above Acts and any consent of the Board of Trade to be given under the provisions of the Public Utility Companies (Capital Issues) Act, 1920.

(3) That any moneys which the Directors may borrow by the issue of redeemable debentures or redeemable debenture stock shall be borrowed subject to the condition that such debentures or debenture stock shall be redeemable at such period, not being more than twenty years from the date of the issue of such debentures or debenture stock, as the Directors may determine.

(4) That with regard to any redeemable debentures or redeemable debenture stock, the Company may—

(1) Call in and pay off the debentures or debenture stock, or any part thereof, at £100 for every £100 of debentures or stock at any time before the date fixed for completion.

(2) redeem the debentures or debenture stock, or any part thereof, either by paying off the same, or by issuing to the holder thereof (subject to his consent) other debentures or stock in substitution therefor, and may, for the purpose of providing money for paying off the debentures or debenture stock, or providing substituted stock, create and issue new stock (redeemable or irredeemable) or re-issue debenture or debenture stock originally created and issued as aforesaid, so however that the creation and issue for that purpose of any debentures or debenture stock does not make the total nominal amount thereof exceed the amount which the Company are for the time being authorized to create, except during the necessary interval between the creation and issue of the new debentures or debenture stock and the redemption of the old debentures or debenture stock.

The CHAIRMAN said the proprietors had heard the resolutions read by the Secretary, and the explanation that he had given in his opening speech at the ordinary meeting. It was absolutely necessary that they should increase their powers of borrowing. They had works that must be carried out to enable them to deal with the increase of consumption that took place from time to time. Their Engineer had told them that the actual increase since July 1 was 13·3 p.ct.; and at this rate of expansion, if they had a severe winter or two, they would be in a great fix to meet requirements. They were trying their best to carry on; and they must have more capital. They had, however, to go through certain preliminaries before they could bring the new powers under the Capital Issues Act into force to enable them to raise money on better terms than in the past—that was, better terms for the investors, but not for the Company. There were now so many outlets for profitable investment that were inviting to the public that stock, at the price the Company could issue it at under their existing powers, was not taken up as it was a few years ago.

Mr. CASH, in seconding, said the resolutions no doubt sounded very complicated and long, drawn in the way that lawyers generally drafted such documents. But it might all be reduced to very few words. There were certain powers which the proprietors had entrusted to the Board to create certain loan capital. They were asking the proprietors to wash out all these, and to start afresh, because of the position of the Money Market to-day. They began by making the comprehensive sweep in the first resolution. Then in the second resolution the Directors were asking for formal authority to raise the money authorized to be borrowed under the existing Acts, and any further monies for which the consent of the Board of Trade was given under the Public Utility Companies (Capital Issues) Act, limiting that in the third resolution to the effect that it was redeemable at not more than twenty years from the date of issue. Then by the fourth resolution the stock might be called in and redeemed, or they might issue to the holder, with his consent, other debentures or stock, provided that the total nominal amount did not exceed the amount which the Company were for the time being authorized to create. He might say that the Directors would not exercise these powers unless the money was absolutely essential; and the proprietors might trust them, in the interests of the undertaking, to raise the money by borrowing on the best possible terms. In the present state of the Money Market, it was exceedingly difficult to say what form the issue of capital should take. At one time it might be best to issue redeemable stock, so that, if the Company paid a high price for it, it could be paid off as the Money Market became better, or, on the other hand, they might issue permanent stock at a lower rate of interest. Therefore they asked for wide terms, so that they might determine what was best to be done in the circumstances at the time.

The resolutions were unanimously adopted.

Glover-West Installation at Perth.—The Perth Town Council are making application to the Secretary for Scotland for sanction to borrow £65,000, to defray the cost of an installation of Glover-West vertical retorts, along with coal-handling plant.

Weymouth Consumers' Gas Company.—Referring, in their half-yearly report, to the very high price of coal, the Directors remark that fortunately, by improved working, a large reduction was made in the quantity used; but, nevertheless, the total charge is much heavier, as it also is for wages, rates, &c. There was, however, a considerably larger yield from residual products. This extra revenue provided sufficient profit to pay the usual dividend, and so enabled gas to be sold at practically the cost of production. The quantity of gas sold in the half year was 78,366,300 c.ft., being very nearly equal to that of the corresponding half of the year 1919, when 79,108,000 c.ft. were accounted for. The decrease thus shown is 0·93 p.ct. After paying the fixed interest upon the debenture stock, and providing for depreciation in the market value of investments, the profit at the credit of the net revenue account is £8847. Out of this, the Directors recommend the payment for the half year of a dividend on the ordinary stock at the maximum rate of 5 p.ct. per annum, less income-tax.

CHESTER UNITED GAS COMPANY.

At the half-yearly meeting of the Company, the Directors submitted a report which stated that the accounts for the six months to June showed that the expenditure generally, and particularly that upon repairs and maintenance, had largely increased. This was partly due to the carrying-out of renewals which could not be effected during the war; but the main cause was the heavy increase in cost of labour. After providing for payment of interest on the debenture stock and dividend on the preference stock, there remained a net balance of £4432 available for dividend on the ordinary stock; and the Directors recommended the payment of an interim dividend in respect of the half year at the full statutory rate of 5 p.ct. per annum.

The CHAIRMAN (Sir J. M. Frost), in moving the adoption of the report and accounts, referred to the extent to which prices had risen; and he quoted as an instance the fact that the cost of one retort delivered in Chester in 1914 was £4 16s. 8d., while to-day it was £17. The accounts showed receipts from all sources amounting to £46,863, an increase of £5747; and an expenditure of £41,126, which was £5549 more than a year ago. The balance of profit for the half year was therefore £5737, compared with £5538 in 1919. The Company had a good body of workmen, and a conscientious and painstaking staff; and he had every confidence that they would maintain the amicable relationship which had existed for so many years.

The report was adopted, and the dividend recommended was declared.

MANCHESTER GAS CHARGES.

Another Advance of Sixpence.

Faced with the continuous increase in wages and cost of materials, the Gas Committee of the Manchester Corporation, at a special meeting held on Friday last, resolved to ask the City Council to sanction their proposal to raise the charge for gas by 6d. per 1000 c.ft. Alderman William Kay, J.P., was in the chair; and after his statement of the financial position, the Committee unanimously acceded to the proposal to raise the charge from 4s. to 4s. 6d. per 1000 c.ft. to consumers in the city of under 250,000 c.ft., and from 4s. 3d. to 4s. 9d. to those outside the city. These prices are subject to a discount of 2d. per 1000 c.ft. for early payment. Consumers of amounts over 250,000 c.ft. are charged a less sum than the ordinary consumer. The prices were raised a year ago to the present level.

THE POSITION LAST MARCH.

At the end of the last financial year, the Committee estimated that, having regard to the information then available, and with gas at existing prices, the income for the year would about meet the expenditure, including interest on mortgage loans, but excluding commitments on appropriation account.

Though provision was made in the estimates for a further increase in the costs of labour and materials, the Committee now find themselves faced with such further increases that they have no option but to raise the price of gas. Advances in wages to general gas-workers actually conceded during the present year amount to £45,000 per annum; while other concessions are estimated to cost £15,000, making the total cost of concessions granted this year approximately £60,000 per annum. In addition to increased costs all round, the Committee are carrying-out large extensions and renewals of plant, which for the time being will deplete their reserves to a considerable extent.

The estimated additional burdens on revenue account not provided for in the estimates and accounted for mainly by the extra cost of labour and materials amount to £92,100, which, added to the deficit of £85,760 already estimated for, gives a revised estimated deficit at the end of the present financial year of £177,860, equivalent to 7·61d. per 1000 c.ft. on the estimated sales of gas.

With such figures before them, the Committee feel they have no alternative but to increase the price by 6d. per 1000 c.ft., to take effect as from the reading of the meters in September next. This increase is expected to yield approximately £100,000 during the remainder of the current financial year.

As regards the large outlay on the renewal of plant which the Committee are now called upon to meet, at considerably enhanced cost, they are fortunate in possessing an ample renewals fund, which has been built-up gradually in past years.

GLASGOW CORPORATION GAS REPORT.

The Gas Committee of the Glasgow Corporation have submitted to the Corporation their fifty-first annual report and balance-sheet of the gas undertaking, which embraces the year from June 1, 1919, to May 31, 1920. The gross revenue amounted to £2,168,726, and the gross expenditure to £1,975,010, to which was added depreciation written-off capital assets, £51,796, making £2,026,806. The balance carried to profit and loss account was £141,920. The Committee had to meet requirements for annuities, interest, and sinking fund, amounting to £152,360, leaving a deficit on the year's operations of £10,440, which has been met out of the reserve fund account, leaving at the credit of this account, £39,450.

The coal carbonized during the year was 808,218 tons, as compared with 832,424 tons for the preceding year—a decrease of 24,206 tons. The average cost was 26s. 8·951d. per ton, being an increase of 3s. 1·459d. The quantity of coal gas made per ton carbonized was 10,097 c.ft., which, with water gas, gave an average of 10,870 c.ft., compared with 9967 c.ft. and 10,271 c.ft. respectively per ton for the previous year. The gas delivered and accounted-for during the year amounted to 7,925,042,103 c.ft., as compared with 7,911,820,004 c.ft., an increase of 13,222,099 c.ft., or 0·167 p.ct. The unaccounted-for gas was 9·799 p.ct., compared with 7·467 p.ct. The greatest quan-

tity of gas sent out during the year in 24 hours was 34,945,000 c.ft.; and the maximum daily make was 33,429,000 c.ft.

The number of ordinary meters in use on May 31 was 193,008, as compared with 192,401 for the preceding year, an increase of 607. The number of prepayment meters was 103,583, as compared with 103,536, an increase of 47, giving a net increase of 654 meters. The total length of mains is about 1083 miles.

A contract has been placed for the erection of a vertical retort plant at the Provan works to carbonize 1356 tons of coal per day; and the work is well in hand. Contracts have also been placed for the coal and coke handling plant in conjunction with these vertical retorts. A contract for gas-compressors to deliver high-pressure gas from the Provan works to the Tradeston and Dalmarnock works has also been placed. At the Tradeston works, a gas boosting plant, to deliver gas to districts which are deficient in pressure, is being installed, and should be ready for the coming winter.

The operations of the chemical works during the year were confined to the treatment of tar and ammoniacal liquor from the Dalmarnock gas-works, where the quantity of coal carbonized amounted to 101,517 tons, as compared with 87,890 tons the previous year. A very satisfactory production of tar and sulphate of ammonia was obtained, which resulted in a net revenue of £44,569, as against £22,692.

ANNUAL REPORT AT JOHNSTONE.

The annual report of the Johnstone Corporation gas undertaking, prepared by the Engineer and Manager (Mr. James Dickson) states that the year has been marked chiefly by the rising costs of material and wages; but the utilization of gas for many industrial and household purposes continues to be more and more taken advantage of, and the loss of consumption due to the discontinuance of war needs is now in process of being recovered.

The gas made in the year amounted to 117,913,000 c.ft., compared with 119,065,000 c.ft. the previous year. The quantity of coal carbonized was 7434 tons, as against 7600 tons; and the make of gas per ton was 15,861 c.ft., compared with 15,666 c.ft. The carbonizing results show that efforts have been directed towards keeping the coal account within limits which, in other circumstances, would have reached more imposing dimensions. An appendix to the report showing the coals carbonized over the past ten years indicates that in 1910-11 the make of gas was 72,813,600 c.ft. and the coal carbonized 8183 tons. Wages amounted to £6366, compared with £4739 last year. Maintenance of works cost £2932, compared with £1909 for 1918-19; but the first-named sum included the renewal of two ovens of vertical retorts after seven years' use. Rents, rates, and taxes have increased from £1737 to £2642, and the total expenditure from £21,673 to £27,459.

The income from gas sold was £21,807, compared with £16,349. gas residuals receipts amounted to £10,135, against £8421, other revenue brought in £619, compared with £468, and the total for 1919-20 was £32,562, compared with £25,239—an increase of £7323 over the previous year. The balance on revenue account amounts to £5102; and the credit balance on net revenue account for the year is £836.

The outstanding loan debt at the end of the period was £38,687, equal to £370 per million cubic feet of gas sold, compared with £22,754 and £312 in 1910-11. During these years, capital expenditure to the extent of £33,245 has been incurred; and the extraordinary cost of constructional work at the present time compared with the cost during these years, and more especially from 1912 to 1916, demonstrated the wisdom of the policy embarked on then, as the greater part of the extension had already been carried out. It was agreed to continue the extension scheme in so far as the conversion of the retort-house into a store and sulphate house was concerned, and to obtain offers for a sulphate plant of 2 tons output per day.

MR. CLYNES ON UNAUTHORIZED GAS STRIKES.

The annual conference of the National Federation of General Workers opened at Oxford last Thursday, under the presidency of Mr. J. R. Clynes, M.P., who, in the course of his address, criticized the unauthorized strikes in the gas industry, as being the wrong way to advance workmen's claims.

He said that in the past few weeks the Federation had been faced with a number of unofficial and sudden stoppages. He did not declare that there never was an instance where workmen should be supported in an unauthorized strike. But in such cases there must be the element of wrong suddenly inflicted on workmen, or conditions which, owing to the hastiness of employers or their agents, had not permitted workmen's leaders to consider what should be done. No such conditions existed in the recent strike of gas-workers. The terms of the ballot placed in the hands of the executives of the various unions the authority to advise and decide on whether there should be a strike or whether certain terms should be accepted. The leaders, therefore, were bound to repudiate the unauthorized stoppages. "The wrong way," added Mr. Clynes, "to advance workmen's claims is to set aside the bargains which for the time being leaders enter into, and take a line which makes it impossible for men to secure the support of their unions."

Reduction in Price at Tynemouth.—Notice is given by the Directors of the Tynemouth Gas Company that, in consequence of the very favourable prices at present ruling for residuals, the price of gas in the Company's area of supply will be reduced by 6d. per 1000 c.ft. This reduction takes effect on all gas consumed after the reading of the meters for the quarter ended June 30.

THREATENED COAL MINERS' STRIKE.

The Position of Gas Undertakings.

Yesterday, the Miners' Federation of Great Britain began to take a ballot of their members as to whether they are in favour of a strike to enforce claims (refused by the Government) for a reduction in the price of domestic coal by 14s. 2d. a ton, and an advance in wages of 2s. per shift for members of the Federation 18 years of age and upwards, 1s. from 16 to 18 years, and 9d. per shift below 16 years. It was expected that the ballot would give the necessary two-thirds majority in favour of a stoppage.

Exports abroad having been temporarily limited, says the "Daily Telegraph," the supplies for London have recently been increased; and, in fact, the total for the past year is now understood to be in excess of the pre-war year. Considerably more than one-half of the coal received has gone to domestic purposes, among which are included by the statisticians public utility services, such as gas and electricity undertakings. While these concerns have laid in as large reserves as possible, Mr. A. R. Duncan, the Coal Controller, recently took occasion, on meeting a deputation of the Miners' Federation, to assure them that a statement in a newspaper that a nine months' reserve had been built-up as a result of the limitation of exports, was preposterous. The restriction in question was, he pointed out, imposed only in order that certain home demands might be satisfied. Asked whether this was equivalent to saying that the coal which had been held back was being kept in stock, the Coal Controller explained that if a lighting or power company could take in only 50,000 tons a week, and yet in the winter their consumption reaches 80,000 tons, a very large reserve stock must be held for the winter. This was altogether apart from the delays caused by fog. Last winter London was extremely fortunate in regard to stoppages caused in this way; but the only time the companies could make additions to their reserve stocks was in the summer. Under the coal control, the necessity for making this summer provision was fully recognized; and consequently Mr. Duncan justified the action of the Government on that account alone. While a good deal of reticence is displayed as to the actual figures, the position has, it is admitted, greatly improved since the earlier months of the year.

"Though the stocks are still not as good as would be held in normal years," said Mr. E. J. Fottrell, the Manager of the National Gas Council, to a representative of the "Daily Telegraph," "there is no need for public alarm. In the event of a strike being declared, it is very probable that the gas pressure would be at once lowered; but the London companies can face a month's strike without fear, and even if the trouble lasted for a longer period the domestic consumer would still be supplied. By then it is most likely that many businesses would have had to close-down, and thus the companies would have their task reduced. It does not need a coal strike to galvanize the gas industry into action. Following the normal procedure, the companies have all been laying-in stores when they could do so. The winter requirements are equal to 60 p.ct. of the whole year; and we must take the coal as we can get it. Some of the smaller companies situated in places where transport conditions are bad may find difficulty in carrying on; but they will be the exceptions."

Reports from different districts are to the effect that at Ilford most of the cooking is done by gas; and a stoppage of the gas supply would inflict greater inconvenience upon householders than a temporary dearth of coal. Most of the large works in the Mitcham district—including the Wandsworth, Wimbledon, and Epsom District Gas Company—have good stocks; while at Sutton the Gas Company have coal enough for a month or two, and do not anticipate having to reduce the gas supply to any extent in the event of a strike.

THE GAS-WORKERS' DISPUTES.

The Conference at Oxford.

On Wednesday last, representatives of the Executive Committee of the various unions affiliated to the National Federation of General Workers connected with the gas industry met at Oxford to consider the position with respect to the claim for an advance of 1s. per shift. Mr. J. R. Clynes, M.P., presided; and at the adjournment, Mr. James O'Grady, M.P. (the Secretary), stated that the following resolution had been passed:

> This conference, having heard the report of the Negotiating Committee, after meeting the Federation of Gas Employers, and having regard to the fact that zoning and grading can be used to meet claims for a further increase of wages to those employed in the gas industry, resolves that the Negotiating Committee be instructed to meet the employers on this issue, on the understanding that the agreement reached in connection with zoning and grading shall be completed at the earliest possible date.

The Labour correspondent of the "Yorkshire Post," writing on the same day, said he understood that a good deal of progress had already been made in the formation of geographical zones in various parts of the country for the fixing of wage rates. For instance, in Lancashire and Cheshire agreement had been reached as to grading the various gas-works into one of three zones. The Negotiating Committee were already engaged in arranging a new standard basic rate of wages for each grade of workmen employed in the industry. As the basic rates for electrical workers had already been fixed by many of the corporations, there was a reasonable hope of a settlement being reached which would give a fairly substantial increase on the present wage.

Trouble Over Back-Pay at Leigh-on-Sea.

There was a threat to strike last Friday on the part of employees at the Leigh-on-Sea Gas-Works of the Southend Corporation. The Corporation had decided to pay the 6s. a week advance under the national award, but to date from July 29, and not from May 1. The claim made

on behalf of the men by the General Workers' Union was therefore for £3 12s. back-pay each. On the following day it was announced that extreme measures had been avoided by the promise on the part of the Corporation to give special consideration to the men's request.

Men's Demands in Scotland.

It has been announced that the Scottish Gas Council intend to resist the claim of the gas-workers for an additional advance, and threaten to close-down the works throughout the country rather than yield to the employees' demand.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 23.

Pitch continues a very active market, and prices still advance; to-day's value being over 200s. per ton net f.o.b. makers' works. Creosote is steady at about 1s. 3d. to 1s. 3½d. per gallon net and naked. Solvent naphtha is quietly steady at about 3s. 6d. per gallon filled into buyers' drums. Pure benzol and pure toluol are about 4s. per gallon. Pyridine bases are quoted at about 20s. to 22s. 6d. per gallon filled into buyers' drums.

In sulphate of ammonia there is nothing further to report. All available supplies are readily taken up.

Tar Products in the Provinces.

August 23.

The average values for gas-works' products during the week were: Gas-works coal tar, 114s. to 119s. Pitch, East Coast, 195s. to 200s. per ton f.a.s.; West Coast—Manchester, 182s. 6d. to 187s. 6d.; Liverpool, 182s. 6d. to 187s. 6d.; Clyde, 182s. 6d. to 187s. 6d. nominal. Benzol 90 p.ct. North, 2s. 6d. to 2s. 7d.; crude 65 p.ct. at 120° C., 1s. 8d. to 1s. 9d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 4d. to 2s. 6d. Toluol, naked, North, 2s. 6d. to 2s. 7d. nominal. Coal tar crude naphtha in bulk, North, 11½d. to 1s. Solvent naphtha, naked, North, 3s. 1d. to 3s. 2d. Heavy naphtha, North, 3s. 4d. to 3s. 6d. Creosote, in bulk, North, liquid, 1s. to 1s. 0½d.; salty, 11½d. to 1s. Heavy oils, in bulk, North, 1s. to 1s. 0½d. Carbolic acid, 60 p.ct., 4s. to 4s. 1d. Naphthalene, £40; salts, £9 to £9 10s., bags included. Anthracene, "A" quality, 1s. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

With the exception of pitch, which retains all its recent strength, the market seems to have developed some irregularity, although the absence of business in several directions makes it difficult to fix prices. Pitch is none too plentiful, and even at £10 per ton there is but little on offer in the North. The fuel position everywhere is precarious; and even if we are fortunate enough to get as far as Christmas without a coal strike, there is not much chance that the miners will restore the output of coal to its former level. Therefore, there are very few offers, and no one can say to what heights the market may go in the coming winter—indeed, anything is possible. The position of naphthalenes remains extraordinarily strong. In addition to pronounced scarcity of refined, there is a heavy demand coming along now from the firelighter industry for crude. Solvent naphtha is a very slow trade, and prices are lower. The increase in the power of production in the rubber goods manufacturing trades appears to have gone too far, and many factories are only producing to half capacity and even less. The result is that little solvent naphtha is being bought. Heavy naphtha is unaltered. Toluol and benzol are very little altered. Cresylic acid is steady; but carbolic acid is rather a depressed market again. For crude, 3s. 9d. per gallon was being asked a week ago; but the quotation is now nominal, although sellers are probably prepared to accept less. Crystal is weak at 1s. 1d., but could doubtless be had for less. Creosote remains steady at 1s. 2d., and is being talked higher. The market in intermediates is steady. American supplies are slightly greater; but prices generally remain firm with a rising tendency. Aniline oil and salts are now 1s. 10d. and 2s. 2d. per lb. respectively. Salicylic acid (technical) is 2s. 7d. per lb.

The range of quotations is as follows:

Benzol: 90% London 2s. 5d. to 2s. 7d., North 2s. 4d. to 2s. 6d.; 50-90% 2s. 3d. to 2s. 4d. London, 2s. 2d. to 2s. 3d. North; crude 60-65%, 1s. 6d. to 1s. 8d.; pure, 4s. per gallon naked.

Crude Tar: London, 87s. 6d. to 90s.; Midlands, 85s. to 87s. 6d.; North, 85s. to 90s. per ton *ex* works. Refined tar, 65s. per barrel (free) on rail.

Pitch: London, 220s. per ton f.o.b.; East Coast, 205s. per ton; West Coast, 200s., with Manchester 195s. per ton, and Glasgow 200s. per ton; South Wales, 222s. 6d. per ton.

Solvent Naphtha: London, 3s. 3d.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 3s. 6d. per gallon.

Naphthalene: Refined, £50 per ton nominal; inferior, £35; crude, £14 to £22, according to quality.

Toluol: Naked, 2s. 11d. per gallon nominal. North, 2s. 9d. Pure, 4s.

Creosote: London, 1s. 1½d. to 1s. 2½d.; North, 1s. 1½d.; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Pyridine: 20s. to 25s. per gallon.

Aniline Oil: 1s. 10d. per lb., drums extra.

Aniline Salts: 2s. 2d. per lb.

Cresylic Acid: 95%, 4s. 9d. to 5s. 3d.; 97-99%, 5s. 6d. to 5s. 9d. per gallon *ex* works London, f.o.b. other ports.

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In view of the Housing Schemes now in progress, it is essential that you should have an effective gas heating agent that may be readily adapted to the orthodox fireplace which popular opinion still seems to favour. You will therefore be interested in the "ENTENTE," further particulars of which will be published in the next issue of the "GAS JOURNAL."

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Carbolic Acid: Crude 60%, 3s. 9d. per gallon; crystals 40%, 1s. 1d. per lb.
Salicylic Acid: Technical, 2s. 7d. to 2s. 8d.; B.P., 3s. 3d. per lb.
Xylol: Pure, 6s.; commercial, 4s. 9d. per gallon.

Sulphate of Ammonia.

The home trade continues along satisfactory lines; and the position for forward deliveries looks very good. For export, the inquiries have fallen away somewhat, and prices are not quite as firm. A study of export figures is of interest. For July, exports totalled 11,582 tons, valued at £411,469, compared with 5372 tons in July, 1919, valued at £130,170. For the seven months of this year, the exports aggregated 57,512 tons, against 27,639 tons in the corresponding period of 1919, and 187,173 tons in 1913. The values were: £1,751,057, £762,258, and £2,593,164 respectively. On the seven months just completed, our largest customer has been Japan, who took 15,660 tons in all. Only 50 tons of this, however, went last month, as Japan's own commercial difficulties compelled her to resell much of what had been previously purchased. France and the Dutch East Indies have been equally good buyers on the seven months, with over 20,000 tons each. Then come Spain, the Canary Islands, and the British West Indies, with between 7000 and 8000 tons. Italy, which in 1913 took 4485 tons in the first seven months, has only taken 20 tons so far; and this went last month. The United States has ceased to be a buyer here, and has turned seller in markets hitherto exclusively our own. A note from Germany says that production has been greatly interrupted in a number of works through strikes and other economic causes, and is still restricted, so that within a relatively short time consumers are expected to feel the shortage more keenly.

Gas Manager Offers to Lecture Ratepayers.—A first ratepayers' meeting at Bawtry (Yorks.) having rejected the local Council's scheme to borrow a sum to expend on the improvement of street lighting during the coming winter, a second meeting was held last week, at the instigation of the Council, and was largely attended. The Chairman said the Council had succeeded in making better terms with the Gas Company, allowing a reduction of 3s. per light; the Company being wishful to do anything possible to help in the lighting of the town. There was lively opposition; and the Manager of the Company, by invitation, explained that the poor gas last winter was due to "stretching" to save coal, and said the quality was now being steadily improved. If ten or more persons would like to learn more about gas, he would be glad to give a few lectures. Most of the complaints were occasioned by faulty burners; and he suggested that consumers might well shoulder the responsibility of keeping burners and globes clean. The Company could produce five times more gas than at present at a small increase in the cost of labour; and the greater the consumption the cheaper would be the gas. The meeting decided in favour of the scheme.

Financial Hardships in America.

Financial disaster faces the Rockford (Ill.) Gas Company, unless a greatly increased revenue is promptly forthcoming. It is declared that the Company have for some time been insolvent, and that the undertaking would have been in the hands of a receiver eighteen months ago, if the Company had been compelled to pay their debts. In a statement relating to the matter, Mr. Samuel P. Curtis (Vice-President and General Manager of the American Gas Company, who are financially interested in the concern) points out that everywhere to-day public utilities securities are considered worthless. Bankers will not take them, and the public do not care to invest in them. Up to 1917, the Rockford Company earned a fair return upon the capital invested. Since that time, however, the revenue has constantly dwindled, though increases in rates have been granted by the State Commission. The trouble with the State Commission's action is that a company must show a loss on operation before the Commission will grant an increase. When the loss occurs, the company files a petition with the Commission. The company must then go on operating with this loss for several months before the increase is granted. As a matter of fact, it was in the last instance almost nine months.

Accrington Gas Board Results.—The annual report of the Accrington and District Gas Board shows a gross profit on the year's working of £19,656, being an increase of £12,038 on the previous year. The gross profit is equal to 11·73d. per 1000 c.ft. of gas sold, and 6·58 p.ct. on the capital indebtedness of the undertaking. The average price received for gas was 4s. 3·91d. per 1000 c.ft., being an increase of 8·07d. over the previous year, and 1s. 7·84d. over pre-war rates. During the year, 37,686 tons of coal were carbonized. The wages paid were £34,695, an increase of £7278. There were 462,838,000 c.ft. of gas produced—an increase of 43,716,000 c.ft., and a record for the undertaking. The unaccounted-for gas equalled 11·88 p.ct. of the gas produced.

Eastbourne Gas Company.—The report of the Directors for the half year ended June states that the revenue account shows a profit of £5392. There is a balance of £7119 at the credit of the profit and loss account, after payment of the dividend last March, and other charges. The Directors recommend the payment of dividends for the past half year at the rate of £3 16s. 3d. p.ct. per annum on the "A" stock, £2 12s. 6d. p.ct. per annum on the "B" stock, and 5 p.ct. per annum on the preference stock. These dividends will absorb £3916, and leave a balance of £3202 to carry forward. The increased cost of coals and materials generally, together with advances in salaries and wages (granted owing to the increased cost of living), has necessitated a further increase in the charge for gas, and under the action of the sliding-scale accounts for the reduced dividend. It is with great regret that the Directors report the death of the Chairman, Mr. John Chisholm Towner. His 23 years' service on the Board (the last five years as Chairman) has been of the greatest value to the Company.

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New Carbonizing Plant for Todmorden.

At Todmorden, last Friday, a Ministry of Health inquiry was held regarding the Town Council's application to borrow £74,430 for the provision of new gas plant. It was stated that the present works were purchased in 1893 from a private company, at a cost of nearly £100,000. The apparatus had become obsolete, and it was intended to instal new plant, including vertical retorts; the tender of Messrs. Drakes, Ltd., of Halifax, having been accepted at a sum of £70,000, subject to clauses making allowance for variations in the cost of labour and materials. A representative of Messrs. Drakes said this was the only method by which work could be carried on at all under present conditions. They had just completed one contract which had cost double the amount of the original estimate. On behalf of the Council, it was stated that the supply had not been sufficient to meet the demand, even after curtailment of the street lighting. The profits had dropped from £3000 in 1914 to a little over £100 at present. Asked whether the Council had considered the claims of a carburetted hydrogen plant, the Manager (Mr. F. V. Barnes) expressed the opinion that such plant was a helpful augmentation of a coal-gas plant, but was not suitable for sole use for public purposes, as the gas produced had not the proper calorific value. The existing plant and the site of the proposed new scheme were afterwards visited by the Inspector.

Askam-in-Furness Gas-Works.—The last annual statement of accounts of the Dalton Urban District Council's gas-works at Askam shows a profit of £145, as compared with no profit at all the previous year. The revenue from the sale of gas has increased by £208, and the cost of coal by £126. In this undertaking there are only 70 ordinary meter consumers, as against 386 through prepayment meters.

Barnet District Gas and Water Company.—A vacancy on the Board of the Company, caused by the death of Mr. J. E. Plummer, has been filled by the appointment as a Director of Mr. William Richards. The balance standing to the credit of profit and loss account amounts to £38,618; and at the meeting next Monday, the Directors will recommend the declaration of a dividend, less income-tax, for the half year ended June 30, at the rate of 9 p.ct. per annum on the "A" and "C" stocks, 8 p.ct. per annum on the "B" stock, and £6 6s. p.ct. per annum on the "D" capital gas and water stocks.

Extended Rebate at Hastings.—The Hastings and St. Leonards Gas Company had in hand at June 30, in connection with the Government household coal rebate scheme, after deduction of allowable expenses, the sum of £2381. This will be distributed among the domestic consumers, and is estimated to represent 6d. per 1000 c.ft. on the gas for the current quarter. The price of gas has been fixed for the time being at 6s. 2d. per 1000 c.ft. for ordinary consumers; but Mr. C. F. Botley (the Engineer and General Manager) points out that further revision may be necessary if additional wages are granted to miners or in the gas industry, or as the result of the rise in railway rates.

Bishop's Castle Gas-Works Deadlock.

A short time ago it was mentioned that the owner of the Bishop's Castle Gas-Works had intimated that he did not intend to make gas for illumination, but only for cooking purposes. A special meeting of the Town Council was held last Thursday evening, to receive a report from the Municipal Corporation's Association on the question; and the Clerk said he had received a letter from the Association to the effect that the Council had no authority in regard to the gas supply. Mr. Edwards remarked that the reply was just what he expected. Mr. Wilkes said it was regrettable that there was no possibility of dealing with the matter; but the Council ought to have been alert earlier. It was stated at the last special meeting that the Council would have sustained a severe loss if they had purchased the works; but he was quite satisfied that the undertaking would have proved a source of income for the relief of the ratepayers, as well as providing an efficient supply of gas. Mr. Greenhouse said he had had the gas-works for a number of years; and they had always paid him well. The reason his son sold the works was because he had other large undertakings in hand. The Mayor suggested that a deputation should wait on Mr. Wenman (the owner); but as there was clear evidence that he did not intend to make coal gas for illumination, the suggestion was not adopted. Two other members of the Council gave it as their opinion that the Council ought to have purchased the works. Much indignation is expressed at the action of the present owner (who is also the principal of the Electric Light Company), in depriving ratepayers of gas, and causing fittings, &c., to be scrapped.

Where Main Extensions are Impossible.—The Kings County Lighting Company, Brooklyn, having announced that it would be impossible to make any additions to the existing mains, because the work could not be financed under the inadequate scale of charges permitted, the New York Public Service Commission started an action to compel the Company to take on additional consumers. The case has, however, been dismissed, on the ground that the Company have not the money, or the immediate assets available belonging to them, nor the resources by which they could borrow money to comply with an order if made. In addition to this, they have not now a plant which is adequate for the work that would be required by compliance.

Figures from Tipton.—The manufacturing statement of Mr. William Prince (the Engineer and Manager) shows that during the past financial year the quantity of coal carbonized at the Tipton Urban District Council gas-works was 12,767 tons, compared with 12,208 tons in the preceding twelve months; the make of gas being 180,861,000 c.ft., against 182,010,000 c.ft. Per ton of coal carbonized, the make of gas in the past year was 14,165 c.ft., and in the previous year 14,909 c.ft. The unaccounted-for gas increased from 6·5 p.ct. to 8·4 p.ct. The gross profit rose from £7178 to £8192; and there was a net surplus carried to accumulated profits account of £3875, bringing the amount standing to this account up to £18,330.

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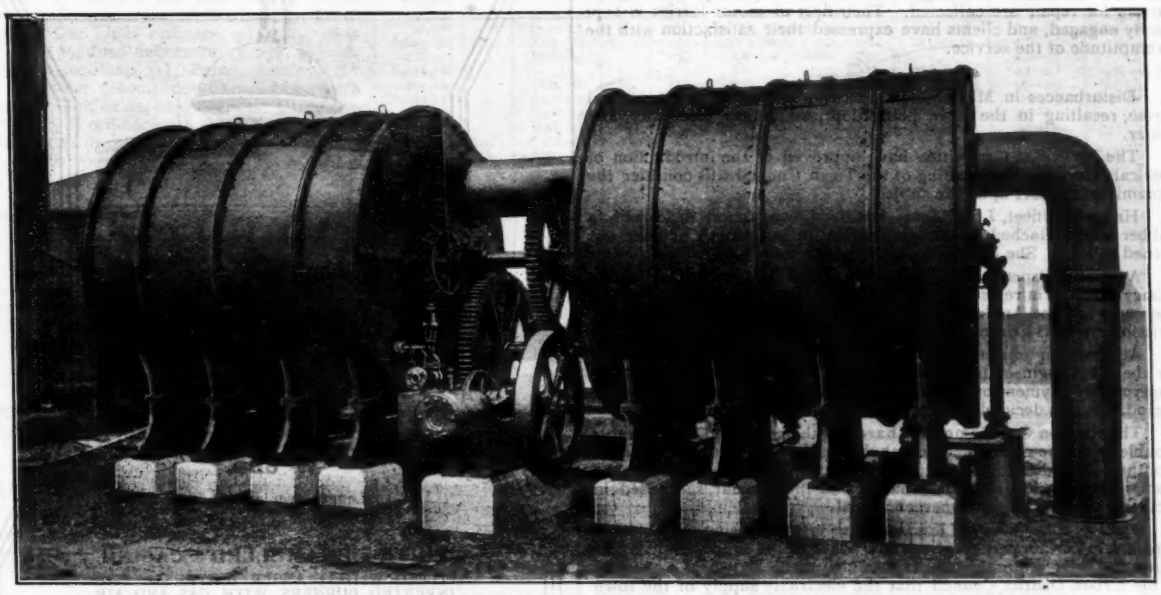

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A Loss at Cudworth.—The Cudworth (Yorks.) Urban Council have approved a decision of the Gas Committee to increase the charges for gas to 4s. 6d. per 1000 c.ft. for power, 5s. for lighting by ordinary meter, and 14 c.ft. for 1d. by prepayment meter. The gas-works accounts for the year ended March show a loss of £867. The previous year's loss was £304.

How to Become a Gas Consumer.—There are evidently times in the United States when it is not easy to become a new gas consumer. This must have been the conclusion arrived at by three residents who petitioned the Commission who control such matters to compel the Middletown (Conn.) Gas Company to lay mains to their premises. They had their petition promptly granted, on one condition—that they should dig the trenches and fill them in after the Gas Company had laid the mains in them. It was contended with very good reason by the Gas Company that it would not be a profitable undertaking for them to lay 325 ft. of mains to supply three domestic consumers.

Larger Sale at Bishop's Stortford.—Compared with the corresponding period of the previous year, state the Directors, the sale of gas by the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company during the past half year shows an increase of 9,174,600 c.ft., or 15·48 p.ct., and the revenue from residuals an increase of £2079; but the cost of manufacture has advanced by the large amount of £6950. The balance available for distribution is £1806; and to permit of the payment of dividends at the authorized rates, the sum of £1000 has been transferred from the special purposes fund. The Directors have been compelled to notify consumers that the price of gas will be raised 1s. 3d. per 1000 c.ft.

Romford Gas and Coke Company, Ltd.—The Directors report an increase in the sales of gas in the past half year of 11·39 p.ct. over the corresponding period of 1919, and a rise in the price of gas of 6d. per 1000 c.ft. The revenue profit carried to profit and loss account is £3185. To this is added the sum of £4 17s. for interest on mains laid on undeveloped estates, making a gross profit of £3189. This, added to the balance brought forward, makes an available total of £8008. After providing for interest, there remains a net balance of £6971. Out of this, the Directors recommend dividends of 5 p.ct. on the original shares, and 3½ p.ct. on the "B" shares, both less income-tax, for the half year. These will amount to £2132, leaving £4839 to be carried forward.

City of Chichester Gas Company.—The accounts for the half year to June disclose a considerably increased income from the sale of gas and residual products; but unfortunately the further largely enhanced cost of coal, labour, and materials has more than absorbed this increase, with the result that the profit balance has been reduced, in comparison with the corresponding half of last year, by the sum of £577. The balance standing to the credit of the profit and loss account (net revenue) amounts to £1742, out of which the Directors recommend the declaration of a dividend for the half year at the rate of 5¾ p.ct. per annum upon the "A" capital stock, and £4 0s. 6d. p.ct. per annum on the "B" and "C" capital stocks (all less income-tax), which will absorb the sum of £901.

Road Transport of Goods.—The question of the delivery of materials and supplies is of pressing importance. The transport of gas apparatus by rail often leads to vexatious delays and to frequent damage—to say nothing of the difficulty of returning empties. The development of road-transport facilities will, therefore, be of peculiar interest to all gas undertakings. The allied firms of Thomas Glover & Co., Ltd., and R. & A. Main, Ltd., have given this matter serious consideration, and have now organized a regular motor lorry service which links-up their various depôts and workshops. New and repair meters, stoves, &c., are delivered to gas-works along the principal routes, and meters for repair are collected. Their fleet of motor lorries is kept busily engaged, and clients have expressed their satisfaction with the promptitude of the service.

Disturbances in Memel (East Prussia) developed into a general strike, resulting in the town being deprived of gas, electricity, and water.

The Perth Gas Committee have approved of the introduction of vertical retorts; and a meeting of the Town Council will consider the Committee's report upon the subject.

Hannah Byfleet, Low Moor, Bradford, was found dead with a rubber pipe, attached to the gas-bracket, in her mouth and the gas turned full on. She had been depressed for some time.

A White Paper issued last week shows the amount of public money invested in registered companies by the Government. Among the items are the Anglo-Persian Oil Company, £5,200,000; and the British Dyestuffs Corporation, £1,700,000.

At a meeting of the Huddersfield Town Council, a letter was read by the Gas Engineer from the National Union of General Workers, applying for payment of wages for men locked-out during the strike period. It was decided that the application should not be granted.

The Skipton Gas Committee have put themselves to considerable trouble to secure emergency household coal for storage until the winter months. At a meeting of the Urban District Council last week, the Committee reported that they had up to the present succeeded in securing 140 tons of such emergency coal.

The gas consumers at Llandudno are just now being put to inconvenience at certain periods of the day, owing to the supply being inadequate for their requirements. It was also made known at a meeting of the Urban District Council that the electricity supply of the town is in a critical state, as it depends entirely upon the generating plant (which is running at its full capacity) not suffering any mishap that would reduce its present output.

An application by the Thornton-le-Fylde District Council to the Ministry of Health has been amended to cover capital charges in connection with the gas undertaking during the next three years, as follows: Mains and services, £2000; gas-meters, £1000; public lamps, £750. From Sept. 30 next, the Council have decided that no further gas-cookers shall be purchased to let out on hire.

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STOCK MARKET REPORT.

THE Stock Exchange has had another week of quietude; the holiday season being in full swing, despite the lamentably unseasonable weather. But in other respects the general position in the House was better than the previous week; the prevailing tone being brighter, and even at times almost approaching cheerfulness. This was to a great extent engendered by the astonishing intelligence from Warsaw of the brilliant repulse of the Bolshevik armies by the Poles—a turn in the tide which had seemed to be past hoping for. The inflated threats from various labour quarters, also, were discounted as being too big in design to be workable. Lastly, uneasiness in regard to the Bank rate rise subsided. So that, altogether, markets did fairly well.

The gilt edged market was prominently noticeable, specially in respect of a demand for the leading Corporation issues as investments. Home Government issues were firm; Friday's figures for the big four being; Consols 46-46½, War Loan 85⅛-85½, Funding 68⅛-68⅝, Victory 77⅛-77⅝. Bonds, also, were generally in great request.

Home Rail prior charges were well supported; but ordinaries were not much in evidence. Canadians were better, and Argentines closed firm, after some up and down movements.

The Foreign Market was variable. French and Belgian were dullish; but Chinese was steady, and Russians were inquired for.

In Miscellaneous, a recovery in Oils was noticeable.

Business in the Gas Market was on a smaller scale. The aggregate of transactions marked showed a falling-off. Even the big undertakings were not exempt. Few variations in quotations were made, and these were mostly in the direction of lower. Gas Light ordinary and maximum were reduced 1 each; and South Metropolitan was drawn in closer. Wimbledon 5 p.ct. fell 3; and Primitiva preference fell ¼. Imperial Continental was little dealt in; but the quotation was advanced 1.

Bargains done for cash during the week were as follows: On Monday, Commercial 4 p.ct. 52, ditto 3½ p.ct. 45½, Gas Light ordinary 51, 51½, ditto maximum 39, ditto debenture 45, Imperial Continental 117½, 118, 119, Liverpool 59, Primitiva 11s. 3d., 13s., ditto preference 30s., South Metropolitan 53½, 54½, 55, South Suburban 62, Aldershot 5 p.ct. maximum 68, 68½. On Tuesday, Bristol 61⅛, British 22½, 22⅝, Gas Light ordinary 51, 51½, 51⅝, ditto preference 56⅜, Imperial Continental 117½, 118¾, ditto debenture 83, Newcastle 60¾, Primitiva 11s. 10½d., South Metropolitan 53⅛, Lea Bridge 5 p.ct. preference 67⅓, 68, Barnet District "C" 124½, Malta and Mediterranean second preference 21s. On Wednesday, European 6½, Gas Light ordinary, 51, 51 7/16, ditto maximum 39, ditto debenture 45, 45⅛, 45⅞, 46, South Metropolitan 54½, Barnet district "C" 125, Newport (Mon.) consolidated 50. On Thursday, British 22, 22¼, 22⅜, 22½, European 6¾, Gas Light ordinary 51½, ditto debenture 46, Imperial Continental 119, Primitiva preference 30s., South Metropolitan 54, 55, ditto debenture 46½. On Friday, Brentford "A" 48½, 49, British 22⅜, 22½, Gas Light ordinary 50½, Imperial Continental 119, Primitiva 13s., South Metropolitan 54½, ditto debenture 45⅝.

In the Money Market, the position for the earlier portion of the week was rendered easy by an abundant supply; but this being rapidly absorbed, and a demand springing up, rates hardened materially. Discount terms were similarly affected. The demand for silver operated a smart rise in the price to 63¾d. The Bank rate is 7 p.ct., as fixed on April 17.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	...	58—63	...
1,551,868	,,	Mar. 26	2½	3⅛%	Alliance & Dublin Ord.	59—64	42—47	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	55—60	...
280,000	5	May 13	7½	8%	Bombay, Ltd.	5⅞—6⅛	4⅝—5⅛	...
50,000	10	Aug. 12	16	5%	Bournemouth Gas and Water — 10 p.c.	29—30	8½—8¾	...
383,110	10	,,	7	7%	Bournemouth Gas and Water — B 7 p.c.	15—15½	8½—9¼*	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13¼—14	7¼—8¼*	...
162,065	—	June 25	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	...	62—64	...
992,045	Stk.	July 14	14	30/-	Brentford A Consolid.	261—266	45—50	48½—49
734,920	,,	,,	11	26/3	Do. B New	204—209	43—48	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	June 10	4	4%	Do. 4 p.c. Deb.	91—93	63—65	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	208—213	121—126	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	80—85	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	61⅛
530,000	20	April 14	12½	10%	British	44—45	22—24	22—22½
120,000	Stk.	June 25	4	4%	Do. 4 p.c. Deb. Stk.	88—90	57—59	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	45—48	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	...
100,000	10	,,	—	4½%	Do. 4½ p.c. Pref.	4—6	5½—6½	...
100,000	Stk.	June 25	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	56—61	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Aug. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	50—55*	52
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	44—49*	45½
475,000	,,	June 10	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	45—47	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	27—32	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	40—60	...
51,600	,,	Feb. 26	14½	10½%	Croydon A 10 p.c.	...	130—140	...
278,400	—	,,	11½	7½%	Croydon B and C 7 p.c.	..	90—100	...
492,270	Stk.	—	6	5%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	6—7	6½—6¾
16,298,975	Stk.	July 29	4/17/4	30/-	Gas Light and Coke — 4 p.c. Ord.	98—102	50—53	50½—51¾
2,600,000	,,	,,	3¾	26/3	Gas Light and Coke — 3½ p.c. max.	76—79	39—42	39
4,062,235	,,	,,	4	4%	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	55—58	56¼
4,674,850	,,	June 25	3	3%	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	45—48	45—46
130,000	,,	Dec. 11	10	10%	Gas Light and Coke — 10 p.c. Bonds.	...	...	...
82,500	,,	Mar. 11	5	3½%	Hastings & St. L. 5 p.c.	...	55—60	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	38—43	...
70,000	10	May 13	11	8%	Hongkong & China, Ltd.	16½—16¾	8½—9¼	...
86,600	Stk.	Mar. 11	9	6½%	Hornsey 7 p.c.	...	88—93	...
131,000	,,	Aug. 12	7½	4½%	Ilford A and C	151—154	84—89*	...
65,780	,,	,,	6½	3½%	Do. B	115—118	64—69*	...
65,500	,,	June 25	4	4%	Do. 4 p.c. Deb.	92—94	55—58	...
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	117—122	117⅛—119
1,235,000	,,	Aug. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	79—84*	83
235,242	,,	Mar. 26	6½	5½%	Lea Bridge Ord. 5 p.c.	119—121	80—85	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. — A.	211—213	...	59
					Liverpool 5 p.c. Ord. — B.	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 12	7/5/6	3⅛%	Maidstone 5 p.c.	...	52—57*	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4½	1¼—2¼	...
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11¼—12	70—75	...
1,875,892	,,	July 29	4½	3½%	Newcastle & Gatsh'dCon.	98¼—99½	60—61	60½
529,705	,,	June 25	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Mar. 11	—	8½%	North Middlesex 10 p.c.	...	13—13½	...
55,940	10	,,	7/14/0	6½%	,, ,, 7 p.c.	14—15	7¾—8¼	...
300,000	Stk.	May 13	8	8%	Oriental, Ltd.	117—122	99—102	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7¼—7¾	2—3	...
60,000	50	Mar. 11	13	7½%	Portsea Island, B	128—131	66—71	...
100,000	50	,,	12	6½%	Do. C	118—121	53—58	...
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	½—1	11/3—13/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4¾—5	1¼—1¾	30/-
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	69—71	...
600,000	Stk.	July 29	4	4%	Do. ,, ,, 1911	...	45—48	...
346,198	,,	June 25	4	4%	River Plate 4 p.c. Deb.	85—87	45—48	...
150,000	10	Mar. 26	6	6/-	San Paulo — 6 p.c. Pref.	10¼—11	6¼—7½	...
125,000	50	July 2	5	5%	San Paulo — 5 p.c. Deb.	47—49	38—40	...
135,000	Stk.	Mar. 11	10	5%	Sheffield A	223—224	68—73	...
209,984	,,	,,	10	4%	Do. B	222—224	58—63	...
523,500	,,	,,	10	3½%	Do. C	220—222	53—55	...
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	June 25	9	9%	South African	10½—11½	11—12	...
6,609,895	Stk.	Aug. 12	5/4/0	30/-	South Met. 4 p.c. Ord.	111—113	53—56*	53½—55
250,000	,,	July 14	—	5%	Do. Pref.	...	91—93	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	45—47	45½—46½
224,820	,,	Feb. 26	8½	3%	South Shields Con. Stk.	157—159	97—99	...
1,087,795	,,	July 29	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	60—65	62
247,558	,,	June 25	5	5%	Do. 5 p.c. Deb. Stk.	116—118	70—75	...
647,740	,,	May 13	7½	3½%	Southampton Ord.	99—102	57—60	...
121,275	,,	June 25	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 12	—	3½%	Tottenham District — A 5 p.c.	135—138	59—64*	...
782,275	,,	,,	6	2½%	Tottenham District — B 3½ p.c.	115—117	51—56*	...
181,255	,,	June 10	4	4%	Tottenham District — 4 p.c. Deb.	87—89	60—63	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Mar. 11	5	3½%	Tynemouth 5 p.c. max.	108½—109	71—73	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8½	55/-	Wandsworth A 5 p.c.	151—156	83—88	...
255,636	,,	,,	6½	40/-	Do. B 3½ p.c.	129—134	61—66	...
108,075	,,	,,	—	38/6	Do. C	...	61—66	...
140,865	,,	,,	—	38/6	New Ordinary	...	61—66	...
352,000	,,	,,	6½	33/9	Wimbledon 5 p.c.	117—122	55—60	...
98,000	,,	,,	6½	40/-	Epsom 5 p.c.	121—126	58—63	...
88,416	,,	June 25	3	3%	3 p.c. Deb. Stk.	66—69	44—47	...

* Ex Div.

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